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Recruiting the Men

MUCH has been heard recently about the need for organised planning (*e.g.*, for five years ahead) in engineering schemes. Less has been heard of the more essential need to obtain the men to make any plans work. Yet this is the crux of the whole matter.

That is why we hope the constructive ideas contained in the paper read by Mr. A. P. M. Fleming before the British Association will receive attention from all concerned in any way in the training of our young electrical engineers. The author speaks from many years of practical experience as a recuiting officer for one of our largest manufacturing firms, and his remarks are as thought-provoking as they are thoughtful.

His starting-point is that our industrial activities should be directed towards the continuous construction of new or improved products instead of towards competition for existing products in saturated markets, including those abroad. We must decide how many men of any given type are required, and then how we are to select them. In the first case we would urge that some flexibility is necessary; the call is for specialisation, but if a youth specialises too early or too narrowly he may find himself unable to adapt his training to changed conditions in an industry that is always rapidly developing in directions that often depend upon the physicist. In this respect large firms with mixed outputs are likely to offer more scope for a broader training than small. Small firms have their advantages in specialised lines, which Mr. Fleming recognises; their inability to finance research on a broad scale is offset by the work of the Electrical Research Association.

Mr. Fleming's schemes commendably provide encouragement to the rank and file to endeavour to rise to the extent of their abilities, but his most notable contribution to the literature of the subject relates to the man destined from the outset for commissioned rank. Under a scheme that he has successfully tried the student first spends a year in the works, after satisfying the entrance requirements of a selected university, and during this period receives a part-time theoretical training. He goes to his university understanding what industry means, and possibly with a bent towards some line of study. On completion of his academic course he returns to the works for another year, so that the total practical training is equivalent to that of a student who completes his college course before entering the works.

The keynote of Mr. Fleming's proposals are self-selection by the youth of his work, and we agree with him that the soundest guide is the judgment of senior men versed in the customs of the trade. Vocational and intelligence tests work so long as the individual conforms to type, but often the best results may be obtained from those incalculable deviations from the norm for which prescribed tests make no provision.

Englishmen are often said to apply hand-to-mouth intuitive methods to work that lends itself to the less wasteful way of exact scientific calculation, but in the selection and training of men it is intuition and a sympathetic understanding of the difficulties of youth that are most likely to give us the men we require.

Hop Drying

THE drying of hops electrically will not bring a big revenue to a supply undertaking, but it should provide an *a fortiori* argument for the application of electricity to other uses. The demand is a twenty-four hour one, and its seasonal character keeps it off the peak, but it is made for less than three weeks in the year. Mr. A. J. Day, who is installing electrode boilers for this purpose at his farm near Staplehurst, in Kent, is so satisfied with his experience of electricity for a variety of purposes that he intends to use it wherever he can secure economy in doing so. He uses the word "economy" in its widest sense, *e.g.*, improvement in the appearance of the hops, simplicity of control, freedom from contamination, and speed of drying. The problem of getting rid of the high moisture content is akin to that found in tobacco curing, which has been carried out electrically by the Electricity Commissioners of Victoria (see our issues of September 4th, 1931, and October 7th, 1932). Mr. Day finds that electrification tends to release men for more produc-

tive work rather than to reduce the number engaged. This accords with the general trend of electrical progress, which is to create new industries and obviate drudgery, and not merely to save labour.

Electrical Trade Activity

THE increased activity which has marked the operations of Messrs. Ferranti, Limited, during the past year or two has resulted in a further very satisfactory advance in the net profit for the period ended at June last. The figures are £68,245, as compared with £57,869 in the previous year and £54,904 in 1932. The dividend on the ordinary shares is maintained at six per cent., and £10,000 is being placed to reserve, as against nothing in 1933. The carry-forward is increased from £46,414 to £51,659. The enterprising policy of works expansion for new lines of manufacture which has been persistently followed by the directors has been well rewarded, and has created opportunities for greatly increased employment at Hollinwood and a more substantial return. Another item of interest mentioned in our financial pages this week is the registration of the Electric Power & Communications Trust, Ltd., a joint interest of the Telephone & General Trust and British Insulated Cables, Ltd., which seems to be intended to engage in electrical development affairs in India and elsewhere.

Legitimate Preference

ACCORDING to a Press report the Master Cotton Spinners' Association has approached the Heywood Town Council (among others) regarding a reduction in the price of electricity to the mills. A councillor objected to what he regarded as " giving a subsidy." We do not suppose there was any question of supplying below actual costs of production, though even that would presumably be no worse than subsidising the non-electrical ratepayer from the profits of an undertaking. The granting of preferential treatment to one class of consumer is not the kind of " undue preference " forbidden by law, so long as any consumer taking a supply under identical conditions receives the same terms. Leaving aside the question of a possibly beneficial effect on the whole community of cutting the margin of profit on a supply to large employers of local labour, it is surely sound to make every effort to enable electricity to compete with steam, as it should almost always be able to do under any satisfactory costing system.

Recovery in America

VERY conflicting reports are received here regarding the success or failure of the National Recovery Administration of the United States. Selected statistics are used in a very loose manner by the supporters and antagonists of the schemes to prove their respective cases. There seems, however, to have been a definite upward tendency in the domestic electricity supply business during the past year. Returns published in the *Electrical World* from seventy-four power companies supplying a grand total of more than ten million consumers show very substantial rises in the sale of domestic electrical equipment. Refrigerators occupy first place, and it is shown that in the first six months of this year 86,898 were sold, as compared with 49,702 in the first half of 1933. The number of ranges sold rose from 11,503 to 27,497; clothes washers from 21,576 to 44,473; water heaters from 3,851 to 9,574; and flat-irons and small appliances from 196,730 to 303,951. It would be interesting to have the corresponding figures for this country.

Sub-stations and the Factory Acts

THE application of the Home Office electricity regulations to sub-stations has been questioned as a result of a case recently decided by the King's Bench Division of the High Court. The case arose from an electrical accident at the insulated h.v. terminals of a transformer (a painter sat on them) in a sub-station occupied by a local authority, which was prosecuted on behalf of the Department for not providing adequate protection of high-voltage conductors. The defence, in addition to disputing this, claimed that as the sub-station contained apparatus on the supply side of the consumer's terminals it came within the meaning of Exemption 2 of the Code. The Lower Court found for the defendants, and as the High Court subsequently refused a Rule directing the Justices to state a case it has been assumed in some quarters that their decision was upheld, both on fact and in law. From a perusal of the transcript of the High Court proceedings we have satisfied ourselves that the legal argument as to exemption failed; in fact, their Lordships said they could not understand why it was ever introduced. The effect of this decision is, therefore, confined to the question of the condition of the insulation in one particular sub-station. It in no way affects the general application of the Home Office Regulations to such places.

Overhead Lines and Aviation

THE Aero Club of France has submitted a resolution to the French Government urging that all electric lines should be placed underground, and that no more overhead lines should be erected. In the Report on the Progress of Civil Aviation (Stationery Office, 5s.) a more realistic view is taken. Investigations are being carried out into methods of indicating to airmen the presence of pylons. The three 60-W red lamps used in some cases are not regarded as altogether satisfactory. The capital cost per tower is £150, and the annual maintenance cost £5. Maintenance is dangerous, and might necessitate the shutting off of a 132-kV supply. The mistake of the Aero Club of France is to regard the question of underground or overhead as only one of expense, whereas it is largely a question of voltage. While the difference in cost of the two methods up to 11 kV tends to become less, the mileage of higher voltage lines will increase (since the appropriate voltage is a function of the load carried as well as of distance). And what about capacity currents?

The Young Idea

THE Electrical Association for Women is entering the second decade of its existence with even more vigour than its first. Before 1924 electrical engineers who perceived the enormous potentialities of electricity in domestic use wondered whether they would be able to convert the housewife to their views. Earlier than this the late Dr. Ferranti had envisaged the help that a corps of electrical women would give to domestic electrification. But the E.A.W. did not stop there; the training of electricooks and demonstrators and the teaching of teachers came within its scope. Miss Haslett has always been a strong believer in directing young minds into electrical channels. Can they start too young? We think not. Yet how many members of the Association will be able to provide their daughters with scale-model all-electric doll's houses this Christmas? We have never heard of one, but what a field for an enterprising British toy-maker!

High-voltage Engineering

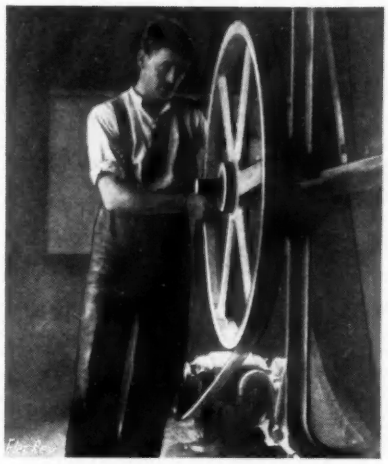
THE course of six lectures by Dr. W. Estorff which the University of London has arranged to be given (without charge) at the Institution of Electrical Engineers each evening at 5.30 p.m., from October 16th to 24th and on October 26th, should contain much to interest practical engineers. We think it unfortunate that the title of the lectures should convey the impression that the subjects to be discussed relate only to 200 kV and upwards, as most of them (*e.g.*, regulation of voltage and power factor, surge protection, definition of interrupting capacity of switchgear and theory of arc quenching) should be applicable to the voltages (with a maximum of 132 kV) that are likely to obtain in this country.

An Electrified Hop and Fruit Farm

New developments in the Weald

ONE of the best examples of the application of modern methods to farming that we have seen is provided by Messrs. James Day & Son at Paley Farm, Staplehurst, Kent. The total area of the farm is 500 acres, of which 150 is devoted to fruit and 60 to hops; 40 acres is arable land and the remainder pasture and woodland. The number of regular employés is twenty-five, but this is augmented in season by 1,000 hop-pickers and fifty fruit-pickers.

For keeping the fruit and hops free from pests some eight miles of piping, with an internal diameter varying from 2 to ¾ in., is run throughout the orchards and hop gardens with standpipes at every 120 ft. to which rubber hosepipes are attached. The solution, which has a copper sulphate base, is delivered at 500 lb. per sq. in. by 10-h.p. motor-driven pumps. One man can spray five acres a day and this method enables the work to be done on the first signs of pest and in one-sixth of the usual time. Normally the orchards are sprayed about seven times a year.



Operating a 60-in. motor-driven fan in the oast house

The average annual yield of hops is 1,200 cwt. and this has to be picked and dried in a little over a fortnight. The old oast houses have been fitted with two electrically driven 24-in. induced draught fans, which allow from 50 to 100 per cent. more hops to be dried in a given time. The new oast house is worked on a principle designed by Mr. A. J. Day. Instead of drying the burden from below with air heated by anthracite fires and allowing the moisture to escape by the cowl at the top throughout the process, a four-pass system is employed in which the cowl is open only in the first stage. In the second stage the draught is through the top of the drying bed (which measures 24 ft. long by 20 ft. wide) and escapes beneath to the atmosphere. In the final passes the air is recirculated both upwards and downwards through the bed.

This method prevents over- and under-drying of the hops (which have an 80 per cent. moisture content) in the bottom and top layers, respectively, and effects a saving of about 20 per cent. Electrode boilers of 200-kW (now on order) are to be used at the suggestion of Major C. B. Grace, managing engineer of the Weald Electricity Supply Co., Ltd., instead of the present oil-steam drying system. A 2-kW heater burns sulphur for bleaching the hops. Two 60-in. fans driven by 5-h.p. motors provide the draught for this plant.

The "Cutler" apple-grader, which is driven by a 2-h.p. motor, will cope with 1,000 bushels per day; it operates on a combined belt and weighted bucket-conveyor system. Sheep-shearing on a small scale and the watering of stock are also done electrically. At the farm-house electricity is used for lighting, cooking, heating and the usual smaller appliances, mains-radio and electric clocks.

The consumption for all purposes is at the rate of 12,000 kWh per annum; a full year's record is not yet available, as the connection to the public mains was made only nine months ago.

Supply is taken at 6,600 V from the Weald Electricity Supply Co., Ltd., by a mile of wood-pole overhead line which is tapped off the four-mile section of lattice-steel overhead line feeding Staplehurst village. This line, which is of Callender's P.B. construction, is remarkably unobtrusive. The farm sub-station, from which it is proposed to give supplies to other consumers in the future, contains a 50-kVA, 6,600/400-230-V Crompton-Parkinson transformer, which is connected to the line without a circuit-breaker. A 400-V, 30-A Simplex switch controls the power supplies and a 15-A Tucker switch sundry single-phase supplies. Metering by Ferranti instruments is on the l.v. side of the transformer. All local distribution is underground. The tariff embodies a fixed charge, based upon a low rateable value, and a running charge of 1½d. to ¾d. per kWh.

We described the system and developments of the Weald Co. in our issue of August 21st, 1931. At the beginning of 1932, the undertaking was acquired by the County of London Electric Supply Co., Ltd. Bulk supply is still taken at 6.6 kV from the Tunbridge Wells Corporation, but a more recently developed district at Hailsham receives its supply at 11 kV from the Central Electricity Board. In contrast to the older area where all except about five miles of cable is underground, the Hailsham end is served entirely by overhead lines.

The total area now covered is 490 sq. miles in West Kent and East Sussex with a population of under 100,000; the largest town is Crowborough with a population of 6,000. By far the greatest proportion of the output goes to domestic consumers, as apart from one fruit-canning factory and a few flour mills and pumping stations there is no load of an industrial character, but 118 farms help matters. Yet the load factor is 33 per cent. and the output to date this year is 25 per cent. above the total for 1933 which was 5,700,000 kWh.

Of the 9,000 installations connected, 3,500 have been carried out under the company's assisted wiring scheme. As the route mileage of mains is 454 (390 underground and 64 overhead) the number of consumers per mile is about twenty. Last year fifty-eight miles of mains were constructed; this year 105 miles have been or are in course of completion. Street lighting (765 lamps) is carried out in the areas of seventeen local authorities.

Although the area is a rural one, the installation work that we have seen there is of a high order. An instance of this is the George Hotel, Cranleigh, a fourteenth-century building which is modern enough in its equipment to have in each bedroom three lights (dressing-table, wash-basin, and bedhead) and a slot-meter electric fire.

For the four years from 1929 the kWh sold was: 1,076,000, 2,044,000, 3,240,000 and 4,411,000. As the Weald undertaking has been in operation only since November 5th, 1925 (when it was a subsidiary company of Messrs. Callender's Cable & Construction, Co., Ltd.), the present state of development may be regarded as satisfactory. The policy has always been to extend the mains in advance of the demand.

In addition to the local office at Highgate, Hawkhurst, there are district showrooms at Crowborough and Forest Row, and a depôt at Horsebridge.

Supply is given at 400 and 230 V from 181 sub-stations, which form disconnecting points on the transmission system. In the greater part of the area they are situated, on an average, about 6,000 yards apart. Full advantage has been taken of natural features to make them as inconspicuous as possible, and this readiness to study local wishes has been found a valuable means of securing local goodwill. Automatic notification of the tripping of a switch is given immediately, as prompt attention to interruptions of supply at any hour of the day or night is especially necessary in view of the large number of electric brooders connected to the mains.

The farm house

Domestic Electrical Appliances. By G. S. Bone

Suggestions for increasing their use

IN encouraging the use of domestic electrical appliances an important factor is the amount of trouble-free work which they will perform. Realising this, many electricity undertakings have placed service prominent in their policies, and it is not unreasonable to suggest that numerous customers have been thereby obtained.

What is service? First, it is exemplified by carrying out maintenance repairs as quickly as possible in all circumstances. It is important also to make sure that consumers have the right type of appliance, even if this means a great deal of trouble and perhaps less profit, while in all cases the same amount of attention should be given after a transaction has been completed as previously. Another point is that a salesman should not allow the fact that it is past closing time to affect his interest should a consumer be rather a long time making up her mind over a purchase or "hire." This may mean a great effort, but it is definitely commendable.

By keeping promises regarding time and date of deliveries mutual benefit can be derived. Only reliable appliances should be sold or hired, and this is most important because results are invariably checked against those obtained from competitors' appliances. Finally, the same attention and energy should be devoted to an order or request whatever the amount of money involved.

These points are not by any means exhaustive, but they will serve as a guide to this comprehensive subject of "service." Some people may say "These service suggestions are nothing new; we always observe them," and to these I can confirm that such efforts are not in vain; to others I would suggest a trial.

The Cooker

Improvements in the design of domestic appliances result in lower maintenance costs to the undertaking, and, more important still, to my mind, tend to reduce the number of tiresome and trifling repairs in the home. With regard to electric cookers, improvements in some types of thermometer shields would be useful. It is most important that the bulb of the thermometer should be adequately protected, as it is always near dishes and trays which are constantly being inserted and withdrawn from the oven. The thermometer is the most fragile part of the cooker equipment, and when broken means a cost of at least 6s. 6d. to the undertaking; consequently one quarter's rental disappears through a slight knock. In some cases the mercury container is recessed into the cooker door and flushed with a fairly wide metal mesh circular disc, an arrangement which should minimise accidents.

Much good would be achieved if manufacturers co-operated to produce a standard instrument, the divisions of which would mean the same regardless of the make of cooker to which it were fitted. It is also essential that all thermometers and heat indicators should be plainly marked showing the condition of the oven for cooking purposes at a certain point. We must bear in mind that a thermometer for cooking purposes is new to most people, and because of this lack of familiarity we sometimes find it rather difficult to persuade a client to use an electric cooker, although she may recognise its superiority. It might be possible to produce a standard cookery book, that is, each publisher would use the same temperatures and more or less the same recipes. This would be possible if a standard thermometer were adopted, and it would greatly assist users who have moved from one area to another.

Assistants and demonstrators in showrooms are often asked how it is possible to keep a pan on the boil without its boiling over when the switch is at "low." The consumer may be advised to use an asbestos mat, vary the quantity of water, or switch on and off intermittently, but I wonder if it is a practical solution to have a lower "low" loading or one plate for this purpose?

"Low-pressure" Salesmanship Best

I believe that a large number of decisions are made at home before the prospective client enters a showroom to make the purchase. I am, of course, acquainted with that branch of salesmanship called "high-pressure selling" which specialises in the hiring or selling of an article to someone who has not previously thought of having it, but for ordinary everyday wares I think the usual procedure is more welcome and successful. If the first assumption is correct, then we must make people think of the electric way at home so that the outcome of their discussion will be at least an investigation.

This domestic discussion can be assisted in a variety of ways, one of which is that the authors and artists responsible for the presentation of articles which have a domestic appeal should be persuaded to portray more frequently domestic methods which have an electrical interest. The illustrations in books are in most cases well produced; they are attractive and without doubt encourage the interest of the reader, thus resulting in the mental storing of an idea for use when the occasion arises. In my experience the electric way is not stressed enough. The conclusion resulting from such an illustrated article may well be: "If Miss ——— uses an electric cooker I think we should consider one." This means that interest has been aroused. In another direction useful "food for thought" can be distributed by assistants who, during casual conversation, acquaint consumers with fresh electrical ideas and new developments. This discussion may not have an immediate appeal, but will be mentally stored and in a surprising way crop up at an opportune moment.

Electric Irons

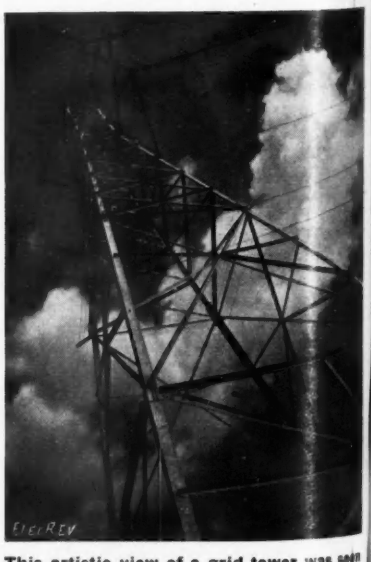
It is well known that the flex and connector of an electric iron offer scope for improvement, and it would be safe to assume that 50 per cent. of iron repairs arise here. Of course, the connector cannot be blamed when it is subjected to treatment for which it was not designed. A difficulty is that the flex is free to twist, and the point which gets most strain is where the strengthening insulation is missing from the conductor, that is, where it joins the contact sockets. This trouble could be overcome if a non-circular cord-grip were fitted; non-circular is specified because although a circular grip would take any amount of pull it would not overcome twisting unless it were firmly gripped in position by the cheeks of the connector. The inclusion of this device should add nothing to the cost of the iron and it would greatly improve its service-giving value.

A minor point in the construction of an iron worth watching is that when a bakelite connector is fitted care should be taken to see that this does not constitute the necessary support when the iron is placed in an upright position. This would probably happen if the proper support had received a slight knock and the contact pins should be placed so as to prevent this happening. At least 3 yds. of non-kinkable flex should be a standard fitting, because more and more irons are being used from plug points which are not generally so near the ironing table as the lampholder.

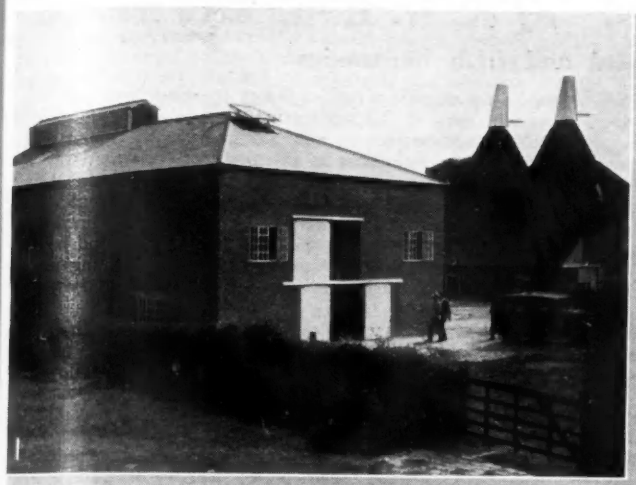
Fires and Boiling Rings

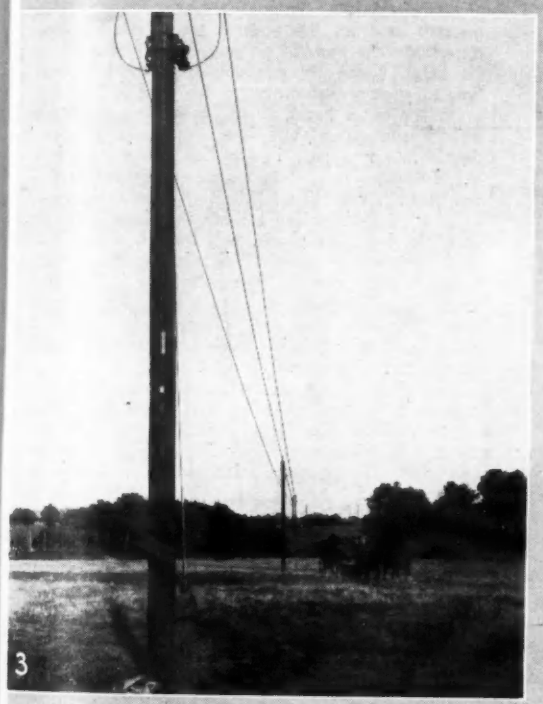
There is a demand for electric fires which can also be used as boiling rings if the number of fires of this type catalogued by the various makers is any criterion. It would be interesting to know whether this dual arrangement gives satisfaction to manufacturer and user from a repairs point of view. It is appreciated by the mechanically minded that such dual-purpose elements are intended for light jobs only, but should their sphere of activity be over-rated then trouble may occur. A deposit of food may lead to a hot-spot and the element will eventually burn out, while a kettle boiling over may cause a crack. In the case of certain types of element a long period in an horizontal position may lead to a centre sag. A fire with a distinct boiling plate in addition to the firebar, therefore, although it is more costly, would seem to be preferable unless reasonable care is exercised.

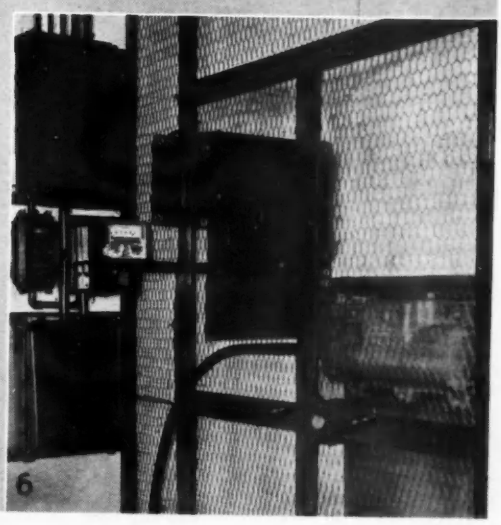
Generally speaking, manufacturers are to be congratulated on having produced a very trustworthy heating element. Success with any appliance depends on its ability to compare favourably with competitors' methods. Quality should always be placed before cheapness, without jeopardising the economic market value of the appliance.



This artistic view of a grid tower was seen at the recent Exhibition of Industrial Photography. (Studio Sun)







A Kentish Farm where Electricity is Used for Many Purposes. **(See page 365)**

1. The new oast-house (on the left) contrasted with the old. 2. Grading apples. 3. The 6.6 kV line supplying Paley Farm. 4. The 500-lb. per sq. in. pumps for the spraying plant. 5. Removing the dried hops from the new kiln. 6. The h.v. sub-station on the farm premises

Magnetising-current Waves.

By A. W. Hirst, M.Sc., A.M.I.E.E.

The influence of third and fifth harmonics

IN the discussion following a recent I.E.E. paper* which contained design details of a number of large three-phase, core type, star-mesh connected transformers, one of the speakers took exception to the high values of flux density employed on the ground that they would produce excessive distortion of the no-load current wave and that while the third harmonic would be negligible, the fifth harmonic would be large and liable to cause trouble with condenser power factor correcting equipments and telephone interference.

Causes of Distortion

The distortion of the magnetising current wave is usually associated primarily with the presence of a third harmonic, but under certain condition the importance of the latter may be less than that of the fifth harmonic.

The distortion of the magnetising current wave, which occurs in all iron-cored apparatus, is due chiefly to the peculiar relation existing between the flux density and the permeability of all magnetic materials, and, to a less extent, to hysteresis, which is always present in some degree. (See fig. 1.)

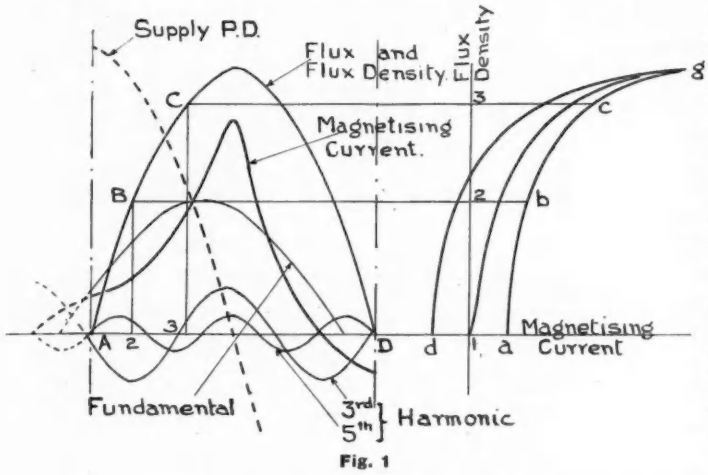


Fig. 1

The effect of hysteresis is to make the wave unsymmetrical and to advance its phase relative to the density wave by a small angle; the small energy component thereby produced represents the hysteresis loss. The wave shape of the no-load current is not wholly represented by that shown above (since eddy current losses are not included), but will be similar in shape.

The distortion in the particular case chosen is due principally to a large third and a lesser fifth harmonic, having amplitudes of 36 per cent. and 13 per cent. of the fundamental, respectively.

Since the upper part of the hysteresis loop is very flat, a small increase in the maximum value of the flux density will necessitate a large increase in that of the magnetising current and consequently in the distortion of the wave. For this reason the maximum density in modern transformers does not often exceed 12,000 to 13,000 lines per sq. cm., as above this value the fifth harmonic, in particular, increases very rapidly.

While a sine wave of flux density requires a magnetising current wave with pronounced third and fifth harmonics, conversely, if the magnetising current is a sine wave, the flux density wave, and hence the e.m.f. wave is distorted and contains pronounced third and fifth harmonics.

This can be seen by constructing the flux density wave from a sinusoidal magnetising current wave as shown in fig. 2, the procedure being similar to that in fig. 1.

The flux density wave shown contains third and fifth harmonics having amplitudes 24 per cent. and 11 per cent., respectively, of that of the fundamental. Whereas in the current wave in fig. 1 both third and fifth harmonics are almost in phase with the fundamental at the maximum value of the latter, thereby producing a peaked wave, the third harmonic of the flux density wave is almost in opposition near the maximum value of the fundamental, so producing a flattened wave. This wave rises to, and falls from, its maximum very rapidly and then produces an extremely peaked e.m.f. wave.

In a transformer connected to a single-phase supply in which the pressure wave is sinusoidal, distortion of the current wave only is likely to occur. On three-phase systems, however, either the current wave or the flux density wave (and hence the e.m.f. wave) or both may be distorted, depending upon the method of connection employed and upon the type of transformer.

In a three-phase, three-wire, star-connected system the sum of the instantaneous values of the currents in all three phases must always be zero, *i.e.*, the sum of the currents flowing towards and away from the neutral point must, at any instant, be the same; this condition is fulfilled by the 120 deg. phase displacement of the fundamental waves. The phase displacement between the third harmonics in the several phases is 360 deg., so that the third harmonic currents in each phase would all be in phase, *i.e.*, all flowing simultaneously either towards or from the neutral point. Under these conditions the sum of all the currents would not be zero; hence triple-frequency currents cannot flow in such a system.

On the other hand, third harmonic e.m.f.'s can exist in each phase, but since they are all in phase, they will not appear in the line pressure: this is the difference of any two phase pressures so that the third harmonic e.m.f.'s neutralise each other.

In a mesh-connected system the third harmonic currents, being in phase, will form a single-phase triple-frequency current circulating round the mesh. This current cannot appear in the lines since the instantaneous sum would not then be zero; nor does the line voltage wave contain a third harmonic; this is completely absorbed in producing the circulating current.

The phase displacement between the fifth harmonics in a three-phase system is 600 deg. This is equivalent to a phase displacement of 240 deg., and this again to a normal three-phase system with 120 deg. phase displacement, but with the phase rotation reversed. Thus fifth harmonic pressures and currents can exist wherever similar quantities of fundamental frequency are possible.

Three Single-phase Units

If the primaries of three single-phase transformers fed from a supply system having a sinusoidal pressure wave are connected in star with isolated neutral and the secondaries open circuited, then the magnetising current wave may contain a fifth harmonic but not a third harmonic. The flux wave will therefore contain a third harmonic but no fifth harmonic, and will produce a phase e.m.f. wave peaked by a third harmonic.

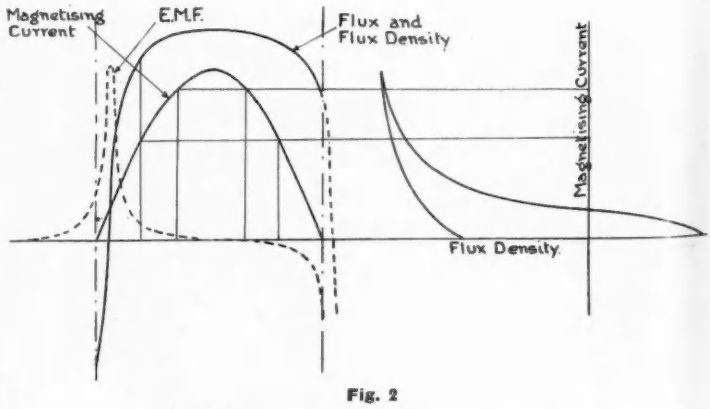


Fig. 2

The latter will be eliminated from the line voltage wave, but its presence in the phases causes the potential of the neutral to oscillate about zero at triple frequency and with an amplitude equal to that of the third harmonic. This may affect the insulation of high-voltage transformers, since under certain conditions this amplitude may be as high as half the fundamental.

If, however, the secondaries are connected in mesh the third harmonic e.m.f.'s in the secondary phase e.m.f. wave will produce a third harmonic circulating current in the mesh, the

* "The Lower Voltage Sections of the British Grid." *Journal* I.E.E., Vol. 74, page 133.

effect of which will be to supply this deficiency in the primary magnetising current. Hence the resultant flux wave will be due to the combined action of a primary current consisting of the fundamental and the fifth harmonic, and a secondary third harmonic current. The third harmonic in the flux wave, so to speak, destroys itself and the resultant flux wave will be almost sinusoidal except for the small third harmonic necessary to produce the requisite triple-frequency circulating current in the secondary mesh.

When both windings are connected in star it is common practice to add another mesh connected winding of small output, known as a tertiary (mesh) winding. This may be used to supply a small external load, but one of its chief functions is to allow the triple-frequency current to circulate and thus to suppress the third harmonic phase pressure.

If the primaries are connected in mesh, then the third harmonic current will circulate in the mesh and there will be no third or fifth harmonics in the flux and e.m.f. waves, which will be sinusoidal.

In a star-connected, four-wire secondary, third harmonic currents can circulate along each line wire and through one phase of the load, returning, all in phase, along the fourth wire, so that even if the primary is also connected in star (though this is not a common connection), partial suppression of the third harmonic secondary voltages will occur in the same way as with a mesh-connected secondary.

The suppression will be only partial since, owing to the relatively high impedance of the circuit, considerably higher third harmonic secondary e.m.f.s are necessary in order to circulate the current. The same effect will occur if there is no fourth wire, but the load is star connected and both of the neutrals are earthed, the return path of the current being then through the earth.

Three-phase Units

All that has been said above applies in general to three-phase units of the shell type, in which the magnetic circuits of the phases are independent. In the core-type unit, however, the magnetic circuits are interlinked and so the third harmonic fluxes, which are all in phase, will have the same direction at any instant, relative to the core, and due to this interlinkage, will have no return path except through the tank. The high reluctance of this circuit reduces third harmonic fluxes and therefore the corresponding voltages to a very low value.

As the transformers referred to in the discussion were core type, connected star-mesh, third harmonic currents can circulate in the mesh whether this serves as primary or secondary, so that in any case third harmonic fluxes and e.m.f.'s will be small and there will be no third harmonic currents in the lines. The necessary fifth harmonic currents will, however, flow along the line wires and may cause trouble if the maximum value of the flux density is high.

Electricity Supply in South Africa

THE eleventh annual report of the Electricity Supply Commission of South Africa covers the year ended December 31st, 1933, and includes a brief review of the activities up to May 31st, 1934, within its area of 11,000 sq. miles.

The principal constructional work in hand during the period comprised four 80,000-lb. per hr. boilers at Witbank power station, two 20,000-kW turbo-alternators at Salt River station (Cape Town), one 20,000-kW turbo-alternator at Congella station (Durban) and two additional traction sub-stations and an extension of the transmission system in the Natal Central undertaking for the additions to the electrified railways.

An agreement has been concluded with the Victoria Falls and Transvaal Power Co., Ltd., for co-operation in the development on the Witwatersrand, and a generating station is to be provided in the Vereeniging district.

The total capital expenditure at the end of last year stood at £8,638,000 and the revenue in 1933 was £1,166,000. Production costs (including capital charges) reached a total of £1,171,000.

The Commission operates five undertakings which are not electrically connected. The sales in thousands of kWh by each were as shown in Table I.

The aggregate represents an advance of about 9½ per cent. as compared with the sales for 1932.

TABLE I.

	Traction.	Bulk.	Power.	Domestic.	Total.
Natal Central	88,995	16,420	3,301	470	109,186
Witbank	—	597,864	40,825	679	639,368
Cape Town	31,586	51,381	16,713	1,006	100,686
Durban	—	118,538	—	—	118,538
Sabie	—	—	6,350	—	6,350
Totals	120,581	784,203	67,189	2,155	974,128

Under its Act of 1922 the Commission is required, as a general principle, to work without profit or loss. The tariffs in force have not been altered since they were particularised in our issue of September 1st, 1933. The number of consumers connected was 2,676. The capacity of the generating plant (twenty-two turbo-alternators) installed remained at 259,350 kW in five stations which generated 1,051 million kW at an average cost per kWh sold of 0.289d. and a consumption of 860,000 tons of coal.

TABLE II.

	kWh. generated (millions).	Load factor per cent.	kW. installed.	Thermal efficiency (sent out).	Cost of coal per ton.
Colenso	124	48.2	60,000	17.40	12s. 2d.
Witbank	682	83.7	100,000	16.38	2s. 7d.
Salt River	109	37.1	50,000	16.5	28s. 4d.
Congella	128	43.3	48,000	18.4	17s. 4d.
Sabie	6	65.8	1,350	—	(hydro)

Two important centres in the Electricity Supply Commission's area:—Above: Durban; below: Cape Town

The outputs and technical performance of each station were as shown in Table II.

The number of boilers installed is forty-two with an aggregate capacity of 2,920,000 lb. of steam per hr. at pressures of from 225 to 425 lb. per sq. in.

The Commission operates 792 miles of overhead lines and cables, 275 miles of which are at 88 kV, 250 at 33 kV, and 95 at 380 V, the remainder being at voltages between 2,200 and 21,000. Associated with these are 388,000 kVA of transformer capacity and twenty converting sub-stations containing thirty-six sets aggregating 70,150 kW.

Another duty of the Commission is to report on electricity supply schemes of urban local authorities. Of a total of 247 municipal schemes reported on up to the end of 1933, 104 were new schemes. Last year such reports covered one new scheme, eleven projects for the extension of existing undertakings, and ten tenders.

The accompanying pictures are reproduced by courtesy of the High Commissioner for South Africa.

Emergency Batteries in Hospitals.

By B. Pontifex, A.M.I.Mech.E.

ATTENTION has been focused on the use of secondary batteries as a "safety-first" standby in cinemas, restaurants, theatres, and other public amusement resorts, but these establishments are not the only places which call for this protection. Hospitals present a problem of equal urgency in the wards and corridors, but in the operating theatre this becomes literally vital. This was recognised by the installation of storage batteries almost as soon as they were available in a reliable form.

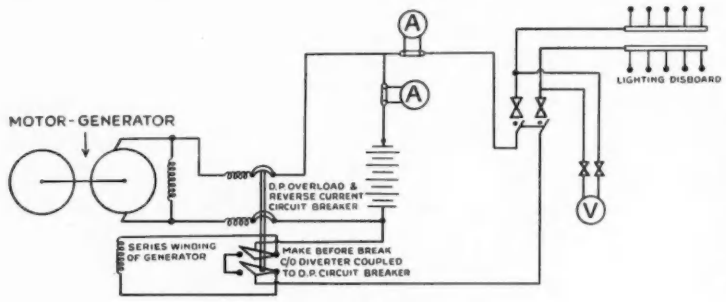


FIG I.

The installations at Brompton Hospital for Consumption (1895) and Bodmin Mental Hospital (1905) illustrate two different aspects of the older methods of application. At Brompton Hospital a private plant was installed, as the supply company's mains were not ready; this plant consisted of a 100-h.p. Crossley single-cylinder horizontal gas engine driving by a belt a 60-kW Siemens undertype bi-polar dynamo. The original battery of 58 Chloride rosette-type cells with a capacity of 890-Ah at the ten-hour discharge rate had to carry the normal hospital lighting when the engine was not running. On the fullest load the battery and the dynamo were run in parallel.

Normally, the battery was floating on the mains at all times. A duplicate battery was installed in 1896, but eventually the plant was shut down and power was taken from the supply company's mains. The contractors were Messrs. Laing, Wharton and Down, and the consulting engineer was Col. T. Ekin. This was the first installation to use ¾-in. lampholders and to run 7/22 wires direct from the fuse-boards to the lampholder terminals.

The original intention had been to use gas for lighting Bodmin Mental Hospital, but a scheme was put forward by Messrs. G. N. Haden & Sons, Ltd., and adopted after being passed by the late Mr. Campbell Swinton. Steam- or oil-driven plant was necessitated by the large demand for hot water and steam for baths, cooking, etc. Three 40-kW Belliss-Royce compound-wound generating sets were put in with a motor-driven booster for charging the battery off the bus bars. The battery comprised 110 Tudor cells of 396 Ah capacity at the ten-hour discharge rate. In March last year the battery was extended. The existing cells were split up into two halves connected in parallel and 55 new cells were connected in series, making the capacity 792 Ah.

Stand-by Systems

There are three different lines on which emergency lighting can be installed in places where local theatre committees, etc., have no authority:—(1) Emergency circuits controlled by a switch which closes the battery discharge on a mains failure. (2) Emergency circuits with an auxiliary battery "floating" and at the same time receiving a continuous trickle charge, when the generator is running, whatever may be the discharge load. (3) Independent portable lamps with separate batteries.

The first system is exemplified by the emergency systems of the different accumulator manufacturers, which can be operated off a.c. or d.c. mains as required. The emergency circuits are fed from a special low-voltage battery, which can be trickle-charged, connected through a special automatic contactor which puts on the emergency lights immediately the supply fails. The following hospitals can be cited as examples of the above:—Beckenham Cottage Hospital, off 200-V 50-cycle a.c.; and Ilford Maternity Home, off 460/230 V d.c. 3-wire.

The second method relates to a more recent emergency unit that has been put in use by the General Electric Co., Ltd., on Mr. Basil Davis's patents. I cannot trace any hospital equipped in this manner, though there are many installations in other public buildings. The battery is always connected across the emergency lighting circuits and, whenever the plant is running, it receives a uniform trickle-charge whatever the load. The emergency and general circuits can be of the same voltage, so that confusion resulting from the use of different lamps is avoided.

If the battery is charged from a motor-generator (fig. 1) the generator field is compound-wound, but the series winding is connected between the battery and the load, not in the customary position in series with the armature winding. Over a load of from 0 to 50 A, on a 55-V emergency battery the trickle-charging current varies between 2 and 3.3 A.

When the emergency circuit is run off a three-phase supply (fig. 2), two hot-cathode rectifiers are connected for double-wave rectification, each rectifier having three anodes. Iron-cored chokes are in series with the rectifier transformer primaries, the choke windings being designed to reduce the output of the rectifiers to a point that will give a trickle charge to the floating battery. The normal voltage of the transformers will give full charging rate to the battery without any regulating resistance between the battery and rectifier. In operation an increase of battery load current affects the three regulating coils, C, and tends to saturate the cores of the chokes to allow more current to the transformer primaries.

The voltage of the rectified current tends to increase with the load to such an amount as to keep the trickle-charge at almost a steady value above the current flowing across the battery.

A Makeshift Method

The third system, employing portable lamps, shares the unsatisfactory character of all makeshifts. If any automatic control switch is fitted, the lamps cease to be portable and, as they are probably few in number, this is serious. If this is not fitted, attendants and nurses must grope for them in the dark, losing seconds which may be fatal. A further objection, on technical grounds, rigidly limits batteries for this work to the steel-alkaline type, as they are capable of holding their charge for an indefinite period practically without loss.

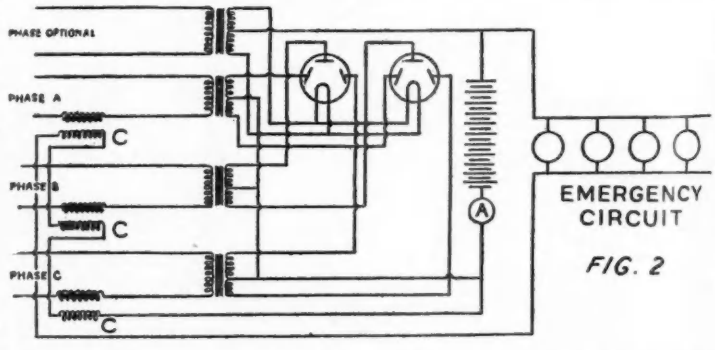


FIG. 2

Electricity in Pumping on the Rand

THE report of the Rand Water Board for 1933-34 shows that the installation of electrical plant at the pumping station continues. At Zwartkopjes a 375-kW reciprocating engine and generator have been replaced by an 1,850-kW steam turbine set. Increased insulation and protection has been provided on the Zwartkopjes-Zuurbekom transmission lines to minimise damage caused by lightning storms. A 1,750-kVA three-phase transformer and circuit-breaker have been installed at the Zuurbekom station, and the existing transformer will act as a stand-by. An electrically driven centrifugal pump with a capacity of three million gallons per day has been installed at the Paarlshoop station. At the main pumping station, Vereeniging, a 950-kW turbine-driven generating set has replaced a smaller set, and the capacity of the plant has been raised to 1,900 kW. The usual practice of shutting down the electrical plant at the Zwartkopjes and Zuurbekom stations was followed during the year. The Zuurbekom lines were affected to the greatest extent. They were shut down on thirty-seven occasions for a total of 117 hours, and on fifteen occasions damage was done to the extent of about £114.

The New I.E.E. Regulations

IN our leading article last week we dealt with the main features of the tenth edition of the Regulations for the Electrical Equipment of Buildings (formerly the I.E.E. Wiring Rules) and Mr. T. C. Gilbert discussed their most important aspect, viz., the earthing requirements. We give below the comments of Mr. W. Cross, who writes from his long experience of electrical contracting on some of the other principal points.

Copies of the Regulations are obtainable from the publishers, Messrs. E. & F. N. Spon, Ltd., or from the Institution of Electrical Engineers, at 1s. 6d. net in cloth, or 1s. net in paper. Their greater range, compared with the ninth edition published in May, 1927, is indicated by an increase in the number of pages from 128 to 176 of a larger size (including fifty-four devoted to tables and appendices instead of twenty-four), and in the number of definitions from fifty-five to seventy-five. For example, definitions of "electrode boiler," "luminous discharge tube" and "mains set" are employed for the first time.

The Regulations are not intended in any way to take the place of detailed specifications or to instruct untrained persons, and they are supplementary to those of the Electricity Commissioners, the Home Office, the Mines Department, and authorities responsible for theatres and other public places. They enumerate the main requirements and precautions for ensuring satisfactory results (including safety from fire and shock) and relate to the distribution of electricity in dwelling houses, commercial premises, public buildings and factories, whether supply is derived from an external source or from private generating plant. In addition, the Regulations apply to radio, electric bell and similar signalling circuits that are directly connected to a public or private supply system or, in certain cases, indirectly connected. They are not applicable to telephone circuits.

The Regulations, which should be in possession of every electrical engineer engaged in installation work, are far too voluminous for detailed criticism here, and in the following notes we can do no more than draw the attention of our readers to a few of the salient points that are not covered by our contributors.

Under the "general" section recognition is given to the use of diversity factor when calculating conductor areas, the permissible allowances being included in a table.

A New Requirement

Section I, under the new arrangement, relates to the control and distribution of supply, and includes a new provision prohibiting the use of a fuse or non-linked switch in a pole connected to earth where multiple-earthing of an a.c. supply is in force. The treatment of final sub-circuits (in Section 2) is far more detailed than it was in the previous edition. Socket outlets are included under this heading (as well as in Sections 6 and 13), and provision is made for small apparatus such as clocks, mains radio sets, bells, and pilot lamps. A distinction is made between switching for d.c. and a.c. outlets.

The general requirements for conductors and cables are dealt with in Section 3 and their installation in Section 4. These have to be taken in conjunction with nineteen tables at the end of the volume, some of which embody the results of recent research regarding the installation of cables enclosed in conduit or steel armouring on a.c. supplies.

Temporary installations have a complete section to themselves. After three months they must comply with the requirements for permanent work. All cables must be of the v.i.r. type, taped and braided or protected with a tough rubber compound. Metal sheathed cables may not be used for temporary work.

Section 6 contains seventeen regulations regarding the installation of accessories and lighting fittings. Among the new paragraphs is one giving the maximum weights permissible to which twin flexible cords may be subjected, the maximum for one cord being 10 lb. The bulk of the regulations in this Section give close details of the installation of socket outlets, cut-outs and switches and account is taken of situations where the voltage exceeds 250, in which case apparatus should normally be not less than 6 ft. apart.

An Important Section

Among the directions for installing current-using appliances in Section 7—one of the most important—will be found the regulations relating to the use of electrode water heaters, as well as motors, cookers and transformers. It is specified that an out-of-balance relay shall operate with an (unspecified) short time delay when the unbalance exceeds either 100 A or 15 per cent. of the full-load phase current of the boiler, whichever is the smaller. This section does not cover signs, these being dealt with in the following one. The term "luminous discharge tube" does not apply to cathode-glow lamps or electric discharge tubes operating at less than 500 V. A recommendation is made that the whole of the apparatus and cables connected to the high-voltage circuit should be examined at least once in every three months by a competent electrical engineer.

The problems associated with the proper installation of all-mains radio sets constitute a development since the ninth edition, and they now receive nearly eight pages in an individual section (No. 9), in which is included a table showing how the various terminals of the apparatus should be isolated from the supply or from the inner structure.

Section 10 is concerned with earthing. An introductory note to Section 11 points out that a satisfactory test result does not necessarily mean a satisfactory installation, and urges periodical inspections and tests. The requisite insulation resistance to earth has been raised to 100 ohms divided by the number of outlets, but it need not exceed one megohm for the whole installation. The installing of private generating plant and secondary batteries is the subject of another independent Section (No. 12); in this a reference is made to "extra-low-voltage" as normally not exceeding 30 V a.c. or 115 V d.c., in which case certain exemptions are permitted.

Design and Construction

An omnibus section (No. 13) sets out the requirements in regard to design and construction of electrical apparatus. The forty-six regulations under this heading include such diverse subjects as cables, switchboards, the rating of cut-outs, plugs, motors, transformers and secondary batteries, but with the aid of the comprehensive index there should be little difficulty in turning up various points in this or any of the other sections.

Some repetition of wording in different paragraphs is noticeable, but presumably the intention of this was to avoid cross reference as far as possible, and the increased simplicity has certainly justified any redundancy.

Some Comments on Leading Points. By W. Cross, M.I.E.E.

THE tenth edition of I.E.E. Regulations for the Electrical Equipment of Buildings is, I consider, an improvement on the ninth edition, particularly as regards the sectionalising of the various regulations. The time that has elapsed since publication has been too short to enable me to consider the new edition in great detail, but so far as I can see the modifications in practice are not great, though the wording has been considerably altered.

When one of the conductors of a system is earthed, it is not now permissible to insert a fuse in that conductor even on a two-wire circuit. This will prevent tests being made easily, and the supply authorities do not always maintain the neutral at earth potential; I can see no reason why a fuse should not be inserted in the earthed conductor of a two-wire circuit.

The section on final sub-circuits is rather complicated and I prefer the old arrangement, in which the size of fuse was governed by the carrying capacity of the smallest conductor and the number of points on a circuit by the current.

The regulation regarding sockets calls for 5-A and 15-A sockets to be wired for their full capacity; this will increase the installation cost and it seems to me that a 10-A socket, which can be fed by 3/.036 cable, will be needed in future for 2-kW fires and appliances of like loading. In many districts, 2-A sockets are seldom used and it will be a long time before old installations can be brought up-to-date, as consumers are not willing to change all the sockets in a house or to introduce a new size of socket (non-standard to them) for extensions.

I am pleased to note that more than ten holders grouped in close proximity to each other can be connected to one circuit, but am not sure of the meaning of the column referring to lampholders in the table, apparently b.c. holders cannot be used on a 15-A circuit.

Sections 3 and 4 are not appreciably altered from the previous edition and are accepted generally as good practice. I have never understood, however, why cables on medium-voltage circuits must be run in screwed conduit only, while low-voltage circuits can be run in other ways; the pressure to earth is the same in either case, and on a standard 230-V three-wire circuit there is medium voltage between the outer conductors.

Section 5, concerning temporary installations, is, I believe, new, and I should have liked to see a reference to transformation down to 50-V on buildings in course of construction, where the risk of shock is always serious.

The section on earthing has been considerably amplified; this important matter was dealt with in the ELECTRICAL REVIEW last week (p. 337). If the tests called for in Section II be fully carried out, the cost of installations will be somewhat increased, but I admit that more testing and examination is desirable, especially on the lower-priced work carried out often by incompetent persons.

The regulations regarding the design and construction of electrical apparatus do not appear to have been much altered in principle, and it is to be hoped that manufacturers will conform to them more closely than in the past, particularly as regards the provision of earthing connections.

The cost of electrical installations will not be appreciably increased by the alterations introduced in the tenth edition; the new regulations will be welcomed by contractors generally, and it is hoped that they will be adopted and enforced more than in the past. Thanks are due to the Committee which has spent so much time in framing these Regulations, which though rather voluminous, contain a great deal of valuable information.

E.A.W. Activities

Programme for the forthcoming season

ALTHOUGH the proposed exhibition and conference on electricity for the working woman does not start until November 12th, there is plenty to see in the way of interest in domestic electrical development at the present time at 20, Regent St., S.W.1.

The programme of the Electrical Association for Women in respect of the coming winter (the eleventh of its existence) seems fuller than ever. Arrangements for the first half of the session include a series of lectures and visits to various places. Two of these lectures will be accompanied by practical demonstrations by Miss D. Vaughan; another will be on modern radio, by Mr. A. Hall, of Ferranti, Ltd., and the visits include those to: Venner Time Switches, Ltd.; "His Master's Voice"; Princess Beatrice Hospital; and the Brompton and Kensington distribution station. The needs of the countrywoman are to be covered by the publication of literature and by lectures to appropriate organisations. Particular attention will be paid to the work of the woman teacher, who will be advised how to explain simply the applications of electricity to school children or to relate it to domestic science. A practical course for teachers, arranged in conjunction with the Battersea Polytechnic, will be held in the electrical housecraft school; two other courses have also been arranged. Teachers' circles have been formed in Liverpool, and a joint one with demonstrators in Manchester.

In future the diploma will be granted to those who have passed the electrical housecraft certificate examination for teachers and who have satisfied the committee as to their teaching experience. Posters showing the cycle of electricity from its generation and transmission to distribution in a house, and literature including "The Electrical Handbook for Women," "Electricity Without Tears" (introducing electricity to children) and "Electricity and Home Appliances," are displayed among the educational features.

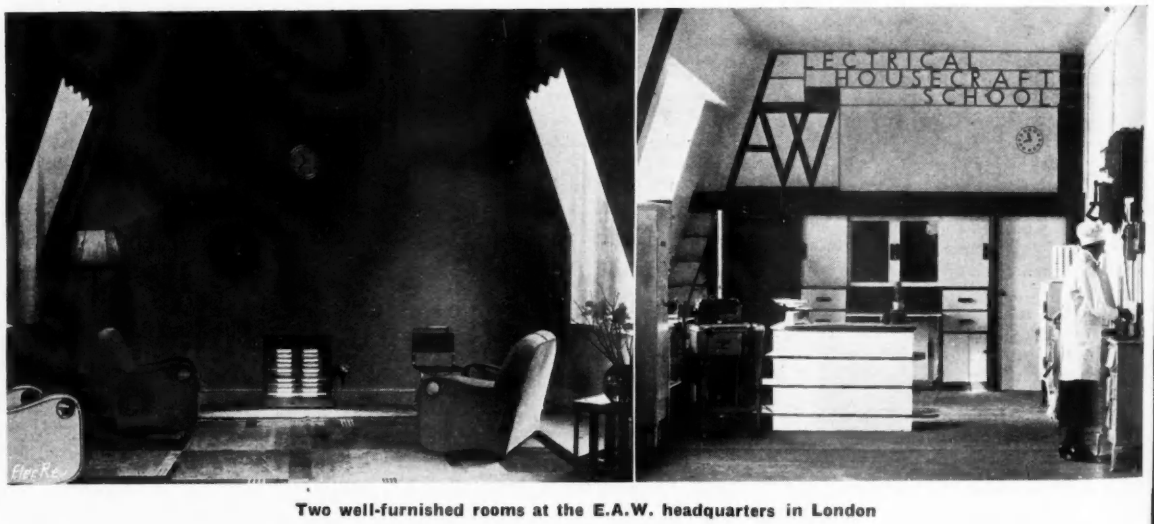
Diploma for Demonstrators and Salesmen

The procedure for the award of the diploma for demonstrators and salesmen is now as follows:—The electrical housecraft certificate is given following an examination. Candidates must hold certain recognised domestic science qualifications. (At the last examination, held in May, 169 entered and 142 passed, 9 with distinction.) After two years' experience in the industry candidates may apply for the diploma, which is awarded subject to their experience proving satisfactory and to their passing a practical test in either cooking, laundry, salesmanship, or a general test in which all three subjects are included.

One result of this is the willingness of electrical engineers to give facilities to trainees in showrooms, thus establishing a definite method of recruitment. Colleges are increasingly submitting syllabi to the E.A.W. for approval, and students who have completed their electrical housecraft training at polytechnics and colleges are granted facilities for receiving special instructions in the E.A.W. electrical housecraft school to equip them for posts as junior demonstrators and assistants. Suitable lectures and works' visits, occupying one evening a week, have been arranged for girls who wish to take up electrical careers.

For the countrywoman there have been published "Useful Information for the Countrywoman," "The Case for Electricity," and "How to Obtain a Supply of Electricity."

To an organisation with a principal aim of collecting and distributing information about electricity as it affects the home, public welfare, hygiene, medicine, smoke abatement, and all social and educative activities, good public speakers are essential, and the speakers' lecture course to be held on September 26th to 28th should help considerably in this direction. Particulars of this course were given on p. 228 of our issue of August 17th.



Two well-furnished rooms at the E.A.W. headquarters in London

The Exhibition and Conference

The exhibition and conference referred to earlier will be opened by the Marchioness of Reading, and it is hoped that during its course, from November 12th to 17th, the Duchess of York will once more visit headquarters. Exact reproductions in miniature of all-electric housing schemes in London will be shown, and lectures will be given by authorities on the subject, including Dr. Sloan Chesser, Mrs. Barton (of the Women's Co-operative Guild), The Lady Pentland, D.B.E., Mrs. Wintringham, of the National Federation of Women's Institutes, and Miss Elizabeth Craig.

The branches will also conduct a campaign in the autumn on these lines, and members throughout the country are making effective contact with housing authorities, builders and architects. Commencing with the big slum clearance plans, the exhibition and conference will demonstrate how the smallest houses can be run cheaply and scientifically with the aid of electricity.

The Association now has forty-two branches, and the formation of a London Branch is to be considered.

A.c. Motor Control Panels. By R. Davies

Problems of the manufacturer

THE general application of alternating current for power purposes has brought into use types of a.c. motors which in the early days were regarded as merely interesting. While the motor maker has been fortunately placed in that the various types differed mainly in the form of electrical windings and so did not seriously interfere with his standardised methods of manufacture, the starter maker has had to supply an almost unlimited number of types, not only for the different kinds of motors but in a number of cases for those of the same design.

The squirrel-cage induction motor for two- or three-phase supplies can be arranged for starting in any of the following ways: Direct across the line; rheostatic, cutting resistance out of the primary circuit in two or more steps; auto-transformer; variable impedance with choke in primary circuit; two-step direct across the line with tapped primary winding; direct across the line with eddy-current rotor; star-delta change-over connection of primary windings for three-phase motors; or series parallel change-over connection of primary windings for two-phase motors. The starter maker must thus standardise at least eight types of starters for one motor, the latter varying only in the winding. In the first six of these methods the design of starter is different for two-phase, four-wire circuits, and may also require modification if the supply is two-phase, three-wire.

For motors with wound rotors and slip-rings, the starting equipment may comprise a circuit-breaker for throwing the primary direct on to the supply, and a starter of the metallic resistance, liquid or eddy-current type controlling the secondary circuit.

The three-phase commutator motor is usually started by throwing the primary windings direct across the lines (as for the squirrel-cage motor) but, in addition, if of the variable-speed type an interlock must be incorporated to ensure that the motor can only be started with the brushes in the minimum speed position. In certain cases it may be necessary to provide a rheostatic starter in the secondary circuit.

Additional Requirements

These methods apply only to the normal standard a.c. motor and do not include power-factor correction and similar machines, for the starting of which some additional features are usually required. To control a synchronous induction motor an exciter field regulator at least must be incorporated with any form of slip-ring motor starting equipment, with possibly an exciter ammeter and voltmeter. Also, the secondary circuit of such machines is usually wound for a higher standstill voltage than the usual slip-ring motor, sometimes as high as 2,500 V, so that a standard starter will not necessarily satisfy the conditions. Normal starters are usually insulated for secondary standstill voltages up to 1,000, and special precautions must be taken when this figure is exceeded.

Designs for secondary windings of synchronous induction motors vary considerably. They may be symmetrical three-phase star; unbalanced three-phase star; two-phase three-wire; open delta connection; or symmetrical three-phase star arrangement for starting with unbalanced three-phase star for running; or some modification of these arrangements. Each type involves an alteration of the normal starter to meet the requirements.

In addition, some synchronous induction motors need a change-over switch for connecting the exciter in the secondary circuit when the rotor has reached full speed, but generally the exciter is permanently connected in the circuit. As the d.c. excitation is usually about twice the normal secondary d.c. value when the motor is operating at unity power factor, the final secondary contact must be of sufficient capacity to carry this increased current. Should the motor be designed for operating on a low leading power factor, say, 0.6 or 0.7, the d.c. excitation may be as high as five or six times the normal a.c. value, which involves exceptionally heavy final secondary contacts.

The normal exciter field regulator is generally similar to that embodied in a variable-speed shunt-motor control panel except that, due to the low voltage of the exciter, the field current is higher than it would be with the corresponding normal voltage d.c. machine.

A further extension called for by some makers is the provision of a main exciter regulator in addition to the field regulator. This has to carry the full excitation current which for a 150-h.p. motor, operating at 0.6 power factor leading, may be about 500 A. This completely upsets the possibility of using anything like a standard panel, so that an entirely special design must be prepared.

The control of a salient-pole synchronous machine involves a totally different type of starting equipment to that required for the synchronous induction motor. It may consist of (1) direct-on-line starter, as for a squirrel-cage motor; (2) auto-transformer starter as for a squirrel-cage motor; (3) direct-on-line starter in series with a "pony" motor which is afterwards cut out of circuit.

Single-phase motors are in greater demand than they were a few years ago, and recent developments have produced a larger variety of types requiring special forms of control gear. The original type was usually provided with two separate stator windings, namely, the running winding and another for starting only. In some cases a three-phase winding is employed, one leg of which is cut out when the rotor has accelerated to almost full speed.

Gear for Single-phase Motors

The starter may be required to provide a resistance in the running winding with the auxiliary winding connected direct across the supply, or a choke may be inserted and cut out along with the starter winding when the rotor has attained a predetermined speed.

The introduction of the capacitor motor is a case of the birth of an idea before its time. Condensers were used with single-phase motors between thirty and forty years ago, but they have only been seriously considered during the last two or three years. In some cases the motor can be thrown direct on the supply, like a three-phase squirrel-cage motor, with the condenser permanently in circuit, while in others a series-parallel arrangement is involved, or a special grouping to fulfil certain starting and running conditions.

Most of these arrangements required a special lay-out of starting panel quite different from that for any of the three-phase motors mentioned, so that the manufacture of single motor control units becomes a never-ending stream of special designs to keep abreast of the motor makers.

To add to the starter makers' problems, any of the gears may be required to be suitable for either manual or automatic control, necessitating an entirely different design of panel. Automatic gears may be arranged for push-button or any of the well-known methods of "on" and "off" switch control requiring three or two-wire operation. If control is from a remote station, relays and possibly a transformer for the auxiliary circuit may also be necessary.

Individual Preferences

In addition to the variety of types of starters, the control-gear maker has still to contend with individual likes and dislikes for particular components of a starter panel, such as that the contactor must be fitted with magnetic blow-out coils, although, for normal sizes, the manufacturer may have found from his extensive experience that they are superfluous. Opinion is still divided on the question of solenoid or overload protection, each type requiring a different size of panel and probably a rearrangement of all the components.

A feature which attracts attention in the case of automatic starters having two or more starting steps is the type of time-relay control. Broadly speaking, this component can be supplied in three main forms, namely, the clock mechanism, dash-pot or thermal types. Each has its sphere of usefulness and limitations; any one type will meet the general industrial requirements, yet there are buyers who will insist upon a certain type simply because they have never had any other.

A point which deserves the consideration of those responsible for drawing up specifications is the size of instruments to be mounted on starting panels. The manufacturer, in preparing a range of gears, has endeavoured to standardise on the most suitable dimension of ammeter or voltmeter for the particular panel, yet a specification may insist upon, say, a 5-in. dial ammeter when the particular standard size may be 4 in. or 6 in., based upon his experience of the general demand. The specification is usually inflexible, thus necessitating additional cost and delay in delivery.

The question of whether or not to incorporate an isolating switch is often a matter of doubt, so that the manufacturer has again to be prepared to supply all the panels with or without this feature, which means additional drawings and sizes to add materially to the multiplicity of designs. It seems strange that the desirability of including this feature on all panels should not have been impressed upon buyers more than appears to be the case. Without it, a separate unit for isolating the starter must be provided in order to comply with Home Office regulations, while if it is incorporated it can be interlocked with the door of the case, thus ensuring "safety first" isolation, and the cost is approximately the same as a starter with a separate isolating switch.

Continuative Technical Education. By R. Wheatley Minter

THE prospectuses that are now being issued by polytechnics and technical evening institutes are the harbingers of a new session of continuative education that will begin towards the end of this month. Every form of instruction is available from some one or other class of institute. Polytechnics and technical institutes proper provide what may be termed serious courses of study, whilst literary institutes provide cultural courses of education. Whereas, for the former hard work, continued application, homework and an examination are the penalties of enrolment, literary institutes are neither so exacting nor so serious.

Nevertheless, excellent courses in general science are conducted and in many cases form a pleasant, easy introduction to any new subject that may—for some special reason—require attention through a change of employment or a development therein. Such courses may often provide the essential stimulus for a more serious course of study later on elsewhere. Little attempt is made to teach electrical subjects in literary institutes, although they are dealt with in men's institutes that are chiefly valuable to artisans seeking to increase their knowledge and usefulness. Wireless, however, has been a stock subject in these institutes for many years.

In general, both polytechnics and literary institutes cater for adults, *i.e.*, those over eighteen years of age. For people under the age of eighteen there are junior technical and commercial institutes, where courses are suitably arranged to meet the needs of those who will attend. These courses, likewise, should be considered as providing the stepping stones towards the senior institutes. It is also sometimes possible to combine technical and commercial courses in one institute.

Selecting a Course

At first, it might seem that nothing is more easy than to decide upon a course of study—usually connected with one's employment—and to embark upon it at the appointed time. In many cases, however, this is not the truth, especially for those who must work through the somewhat unfortunately termed *elementary* courses, that would be far more accurately styled and attractive under the name of *fundamental* courses.

In these days of specialisation it is too generally held that if one wishes to learn, say, electricity, one need only take a course of study in that subject. Nothing is further from the truth, and the greater the advance of scientific knowledge, the less true will it become. Every year many would-be students fall by the scholastic wayside when they find that they are discouraged from attending a single course, unless their qualifications are sufficiently advanced to make it evident that they may benefit substantially thereby.

Lecturers in special subjects have sometimes to modify substantially their mode of presentation of a subject because of the lack of co-related scientific knowledge on the part of those who wished only to attend a specific course without troubling to prepare themselves for continued reference to associated general matter. Alternatively, the statement that "we did not come here to learn *that*" is sometimes heard as protest against the inclusion of matter necessary to proper development of the argument. Such difficulties can most assuredly be attributed to the regrettably all too-current idea that worthwhile accomplishment can be attained without the exertion of equivalent effort.

It is, indeed, no more feasible to cultivate prize vegetables without first hoeing the ground than to imagine that specific knowledge can be satisfactorily gained before learning the fundamental principles common to *all* branches of science.

As knowledge previously gained can be very easily forgotten, a short refresher course is often well worth while as a preliminary to a main course of study when some time has elapsed since normal studies were suspended. Much disappointment may thus be avoided, although the extra work may, at first suggestion, seem a little unnecessary. In no branch of science does this apply more than in mathematics. Principals of evening institutes may generally deal in a sympathetically practical manner with requests for such facilities to be granted.

The Consequences

By far the greater proportion of study in evening institutes should be of a grouped nature, *i.e.*, a specific selection of essentially allied subjects should be taken concurrently through the session. The simplest of such courses generally comprises three subjects and necessitates attendance at the institute on three evenings a week. On the other hand, the more pretentious honours' engineering course calls for an attendance on four evenings and may cover five separately arranged subjects. Hours of instruction are from six p.m. to ten p.m. as a maximum, although the earlier courses and some others (notably the non-experimental) do not actually demand the whole of this period.

Each year class registers show a deplorable diminution in attendance as courses proceed. This is discouraging alike to lecturers and to the remaining students. This falling-off is chiefly attributable to the lack of foresight that should precede entry into a course. The sustained effort required to keep a student regularly in attendance is great and must be borne in mind from the outset.

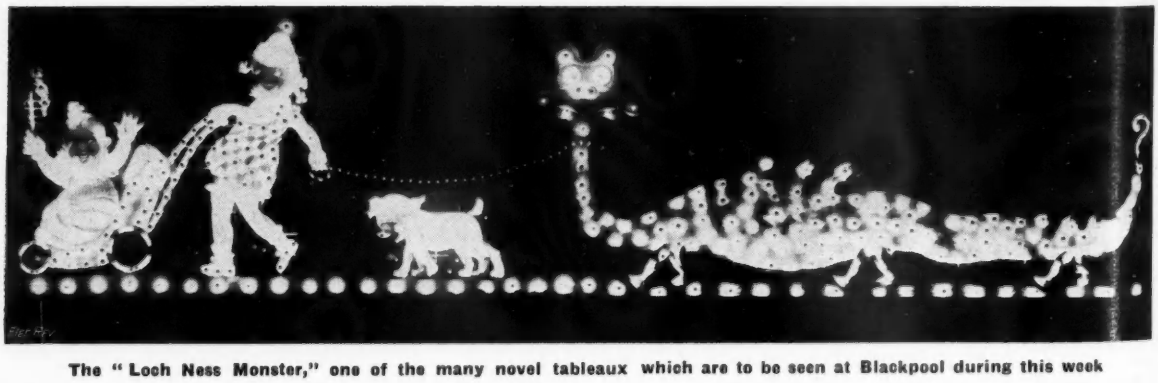
Senior students often find their knowledge is scrappy. What has been learnt previously is, through partial disuse, elusive and in need of revision, whilst other sections, upon which work has been done, are recalled with ease. Consequently, students of this type find themselves working through a course in a series of spasmodic jerks of enthusiasm and despair that calls for considerable self-discipline to preserve proper balance and sustain interest. There is a danger that sections well known will be rushed with scornful indifference, whilst puzzling portions are avoided.

Qualifications of Teachers

These facts provide a strong argument against the wholesale employment of day-school lecturers in evening institutes, as they tend to stress the academic to the exclusion of the practical aspect of technical study. They are not so closely in touch with the problems to which students expect solutions. Possession of university degrees does not necessarily indicate such a high standard of technical attainment, nor possess the same value for certain purposes, as other qualifications, to secure which a well-known standard *must* be reached.

Suitably qualified teachers recruited from industrial activity most satisfactorily fulfil the needs of students seeking normal enlargement of their knowledge that should, in any case, precede a regular degree course of study. Arrangements can generally be made, provided the students are enthusiastic enough, to work through two preliminary courses in one session. Such procedure necessarily shortens study by a year and prevents discouragement so easily engendered when working through subjects for the second time.

Mere attendance at the course of lectures and laboratory work is not enough. The most comprehensive course can only indicate in which direction studies should be pursued. Consequently, proper keeping of notebooks and good attempts at homework problems call for additional spare-time sacrifices. Such sacrifices are not required for the benefit of either instructors or the institutes, but are planned in order that students may receive extra instruction for which there is no time in class hours. Failure to produce well-kept notebooks and homework sheets for marking is a definite loss to the students concerned and is one from which there is no recovery. Whilst, therefore, this work calls for a certain steadfastness of purpose by no means easy to preserve, it will bring its own reward in the end.



The "Loch Ness Monster," one of the many novel tableaux which are to be seen at Blackpool during this week

Supply in the Midland Counties

THE Midland Counties Electric Supply Co., Ltd., serves an area of 2,200 sq. miles in a locality that is sufficiently indicated by naming its constituents. These are the Derbyshire and Nottinghamshire E.P.S., Leicestershire and Warwickshire E.P., Leamington and Warwick Electrical Co., Ltd., and Midland E.L. & P. Co., Ltd., and several subsidiary traction undertakings.

The company commenced operations in 1913, but little progress could be made until after the war. In 1921 the length of mains was 200 miles; to-day it is 2,600 miles. The issued share and loan capital is £6,000,000. The number of consumers is over 60,000, an increase of more than 50 per cent. in the last two years. During the same time the kWh sold has grown by 35 per cent. to 237 million and the kW connected by 23 per cent. to 202,000.

This progress is remarkable having regard to the low population density of the area which, excluding three boroughs in which supplies are given, is only about 440 per sq. mile, as compared with 10,000 to 17,000 in other boroughs in the area that are excluded for supply.

Domestic consumers predominate, but a large number of industries rely upon the company's service, the largest motor connected being 15,000 h.p. The average price paid is 0.9d. per kWh or 1.24d., excluding large high load factor consumers. More than 460 parishes are now given supplies and about 90 per cent. of the villages in Derbyshire are electrified.

The generating plant capacity is now 120,000 kW, and a further 30,000 kW is on order. Spondon, which last year achieved a thermal efficiency of 23.56 per cent. on kWh generated, contains 94,000 kW and Avon 18,000 kW. On the transmission and distribution networks are 133 large, 231 medium, and 618 pole or small sub-stations.

Points in the Midland Counties System

1. A typical 25-kW rural transformer pole. 2. An inconspicuous overhead line in a beauty-spot (Ashford-in-the-Water). 3. The Budby sub-station, ring-main control and step-down transformers. 4. House-to-house wiring in Edensor model village.

Lloyd's Register of Shipping

THE annual report of the Society's operations for the year 1933-34 mentions that following upon the reference in the previous report to the first electrically propelled motor tugs for use in this country, the *Acklam Cross* and the *Lectro*, which had then recently been completed and are now operating satisfactorily in service, a further Diesel-electric tug is now being built, the propelling machinery for which is being constructed under the Society's survey by the English Electric Co., Ltd. Messrs. John I. Thornycroft & Co., Ltd., are the builders of the hull, and the vessel is intended for the Thames Steam Tug and Lighterage Co., Ltd. A research vessel for exploring the upper reaches of the Amazon is now in hand by the Union Naval de Levante, S.A., Valencia, in which Diesel-electric propulsion is to be employed. Details of the vessels with electric drive appearing in the Society's register book at the dates named are given in the adjoining table.

In this connection attention is drawn to the new rules for Electric Propelling Machinery and also to extensive amendments which have been incorporated in the Rules for Electrical Equipment; requirements have now been added dealing with heating and cooking appliances.

Register Book.	Turbo-electric. No. of Vessels.	Turbo-electric. Gross Tons.	Diesel-electric. No. of Vessels.	Diesel-electric. Gross Tons.	Total. No. of Vessels.	Total. Gross Tons.
1925–26 ...	21	84,562	15	25,742	36	110,304
1928–29 ...	23	130,992	30	56,379	53	187,371
1931–32 ...	38	342,400	46	114,690	84	457,090
1934–35 ...	42	444,548	53	118,853	95	563,401

At the International Conference which was held at the Hague in June to consider the desirability of the introduction of international standards for electric fittings and equipment delegates from all the principal European countries were present, and it was agreed that the International Standards Association should be asked to set up a sub-committee to consider the standardisation of such fittings and equipment.

Technical interest in the application of electric arc welding to the hulls of ships continues to be maintained. Of the sixty-four electrodes approved by the Committee, thirty have been approved for use in parts of primary importance.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Mathematical Representation of Hysteresis Loops

On returning from holiday I note the reference in your issue of July 20th, page 79, to certain work by G. Grobe, in which the author claims originality for harmonic analysis of the B-H curve.

The late Professor S. P. Thompson, in a contribution to the Physical Society in 1909-10 (Volume 32, pages 454-475) developed an harmonic analysis of hysteresis loops and gave a very full examination of the results. He showed that all hysteresis loops can be analysed into an harmonic series of Lissajou's figures, but preferred to express the formula in sine and cosine terms in place of the form adopted by Grobe. He showed that the work done was measured by the fundamental sine term alone, all other constituents, whether of fundamental or higher frequencies, representing wattless components.

The Illuminations at South Shields for which "Beeantee" lampholders and material were used

Thompson associated the coercive force with the fundamental and triple-frequency sine components and threw out suggestions for future work. He concluded that harmonic analysis alone did not enable a separation of the eddy current and hysteresis components to be made.

So far as I am aware, this form of analysis has not proved of great utility, but the article is worthy of further study. It is within by knowledge that Professor Thompson had observed the likeness of hysteresis loops to Lissajou's figures as far back as 1897-8.

E. B. WEDMORE,
Director and Secretary, British Electrical and Allied Industries Research Association.

London, W.C.2, *September 14th.*

Belle Vue's Open-air Theatre

I have read with considerable interest the article on Scarborough's open-air theatre in your September 7th issue.

I am afraid, however, that it will be necessary to refute Scarborough's claim to the possession of the first permanent open-air theatre in the British Isles.

The firework spectacle for which Belle Vue has been famous for so many years is staged in a complete permanent open-air theatre, which can claim to be both the oldest and largest in the world.

Our present production, "The Siege of Delhi," is the 83rd annual presentation. Since 1852, without interruption, a spectacle and firework display has been presented each season. The theatre is set on an island within the gardens facing a grandstand which has accommodation for about 3,000 people. Beneath and around the grandstand there is accommodation for more than 10,000 people to witness the spectacle.

The island theatre is 440 ft. long and 150 ft. deep. The painted background is the largest landscape painting in the world, covering over 40,000 sq. ft. It is painted with a new subject each year, the work taking some three or four months, and arranged in a series of wings about 50 ft. in height. A striking effect of depth and distant perspective is obtained. The open stage, where the actual performances take place, is 320 ft.×120 ft., considerably larger than that of any theatre in Britain.

The stage is brilliantly lighted by four searchlights mounted on the top of the grandstand. Two of these are 24-in. carbon arcs and two are 36-in. service type searchlights, the total illumination running into millions of candle-power. There are numerous lighting units on the island itself, which provide the colour changes necessary to the dramatic action. The fireworks are, in many cases, detonated by electricity.

The electrical side of the theatre comes under the general lighting scheme for Belle Vue, which has a capacity of 1,000 kVA, taken in bulk from the Manchester Corporation and transformed in Belle Vue's own sub-station.

Over sixty performances of the spectacle are given each season, spread over various dates from May to October. Each year the theme of the production is some epic of British history and over 250 performers take part. Many of them have played in Belle Vue spectacles for half a century. On occasions special plays and pageants are given, involving as many as 800 performers. It is interesting to note that each production of the spectacle involves 1½ miles of quickmatch, 1,000 rounds of blank ammunition, and 7,000 fireworks at a cost totalling nearly £100. The scenery is painted in the gardens, and every piece of property, clothing, uniforms, headdress, &c., is made on the premises.

WILLIAM RUBINSTEIN, *Publicity Manager,*
BELLE VUE (MANCHESTER), LTD.

Manchester, *September 17th.*

Lighting Service

As an interested domestic consumer I have just paid a visit to the E.L.M.A. lighting exhibition described in your last number. While it is undoubtedly well arranged and calculated to create in any visitor a desire for better lighting, he is likely to receive an unpleasant surprise when he goes beyond what can be done, and asks what it will cost to do it.

In the architectural lighting room some ten different methods are shown, of which perhaps six can be said to light the room for use rather than only to decorate. These six fittings have power consumptions ranging from 1,200 to 3,200 watts. Surely in a room not more than 20 ft. square it is unnecessary to employ on the average the power consumption of a two kilowatt domestic fire to light it adequately and decoratively. Less than 25 per cent. should suffice with better light distribution. The room felt uncomfortably warm and one did not at first realise that the lighting system was to blame. It is surely not necessary to waste 75 per cent. or more of the light in order to get a desired effect. Why, for example, continue to use a multiplicity of small 25- and 40-watt units instead of a few large units of greater efficiency with less cost for wiring, lamps and power? It can be done, as is shown elsewhere in the exhibition, and surely only needs a little intelligent fitting design.

So long as such inefficiency is tolerated the campaign for better lighting is heavily handicapped, and I suggest that a long overdue step in the campaign is greater efficiency in light utilisation.

"CONSUMER."

September 17th.

The Status of the Consumers' Engineer

I have read with interest Mr. Russell Hickmott's letter published in your issue of September 14th.

It has always seemed to me to be a mistake to regard selling electricity as something far different from the selling of any other product. If a man is a first-class salesman he can sell anything. Engineering knowledge beyond the merest elementary acquaintance with certain supply matters is quite unnecessary. It is better that the man selling electricity shall not have much technical knowledge; in my opinion such knowledge will most certainly hamper him in his main task. He must, however, be able to obtain a technical report from the engineers as occasion requires.

Salesmen are born; they are seldom produced by training. The very training of an engineer would tend to make him a bad salesman. The chief requirement of a salesman besides his natural gifts is a fairly good general education.

That so many engineers are also invested with the duty of selling electricity may well be a matter for serious thought in some quarters of the supply industry.

J. LESSER.

London, *September 15th.*

B.I.F. Poster

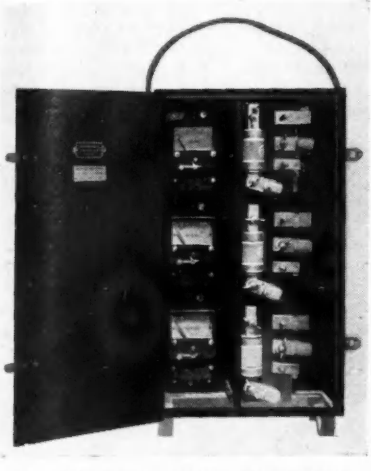
More than 8,000 posters in nine languages inviting buyers to attend the British Industries Fair next year have been shipped abroad by the Department of Overseas Trade for display in forty-five different countries.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Portable Load Indicator

A portable load cabinet has been developed by MESSRS. PRICE & BELSHAM, LTD., Tamworth Lane Works, Mitcham, Surrey, to indicate the maximum load on three-phase l.v. overhead lines. The "P. & B." cabinet is constructed of "Plymax" metal-covered plywood with a weatherproof door. Two curved saddles provided with strong straps are fitted to the back so that the cabinet can be strapped to a pole. It is also equipped with a leather handle for carrying and feet on the base. The equipment comprises three "P. & B." maximum load indicators, one for each phase with its own transformer.



The "P. & B." portable load indicator

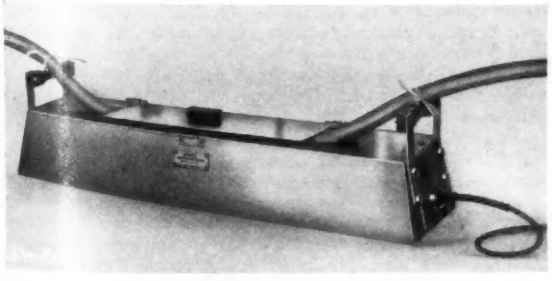
These indicators are thermally operated, but are designed to prevent the accuracy of the readings being affected by changes in the ambient temperature. The complete movement consists of two flat coils of bi-metal strip coupled together at their outer ends. The inner end of the actuating coil is fixed, and the inner end of the compensating coil carries the needle. These coils are accurately matched, and as a change in the ambient temperature causes the outer end of each to rotate through the same angle, no movement of the needle occurs. Near the actuating coil is fixed a small heater element, embedded in refractory material, through which the current passes, the heat from this element acting upon one coil only. The resulting movement of the needle measures the heat, and consequently the current flowing.

The needle carries a pointer which is held by a friction arrangement at the maximum reading. There is only one moving part and no pivots or other delicate feature, as these indicators are intended for portable work and for use in exposed positions. Resetting the maximum pointer can be done without disturbing the indicator. The transformers have wound primaries with two tappings brought out to terminals on a bakelite panel, giving three ranges of 10 to 40, 20 to 80, and 40 to 160 A.

The leads to the overhead lines pass out through the base of the cabinet and terminate in plugs which take the place of the fuse holders in the lines; fuses are provided in the cabinet so that the lines still remain protected. This feature enables the set to be quickly coupled up where required. The weight is 38 lb.

Electric Vulcanising

An improved electric vulcaniser employing the wax-bath principle for repairing tough-rubber sheathed cables is offered by W. T. HENLEY'S TELEGRAPH WORKS COMPANY, LTD., Holborn Viaduct, E.C.1. Rapidity of cure, avoidance of the detrimental effects of heating in air, and absence of hot spots due to contact with heated metal are among the advantages claimed for this method. The use of a special compound eliminates the objectionable fumes generally given off by a wax bath.



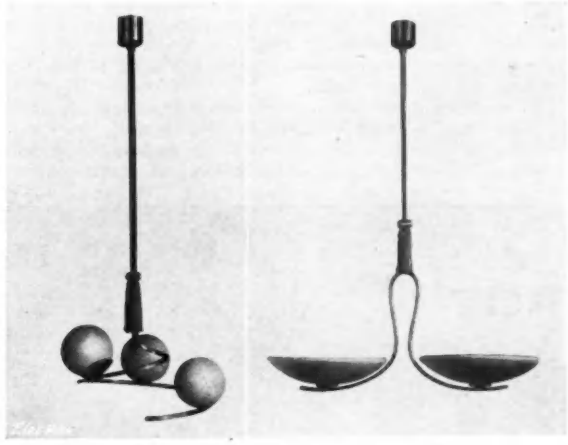
The Henley vulcaniser for t.r.s. cables

The vulcaniser consists of a galvanised m.s. frame into which is sunk a trough for carrying the compound, which is heated by 500-W (total loading) strip elements fixed to its outer sides. The base of the vulcaniser is removable, permitting easy access to these elements. A three-pin 5-A socket and a q.b. switch are fitted. The overall dimensions are 40 in. by 9 in. by 6 in., and the weight is 44 lb.

Cables of widely different diameters can be vulcanised, and more than one at a time, and contact between the cables and the heaters is impossible.

Modern Lighting Fittings

The 1935 lighting fittings at the showrooms of Messrs. E. TROWER & CO., LTD., 2, Basil Street, London, S.W., include the two handsome models which we illustrate. The ply-glass is of



Two modern pendant fittings

a high quality, tinted either pale champagne, rose or green, and a special finish gives the matt-chromium metalwork a dull silver appearance. In each case the support is covered with silk cord, a neat tassel being attached. The fitting with the spherical glassware costs £4 16s. 9d. and the other £5 3s. 9d.

A Condensate Return Trap

A new product of MESSRS. HOPKINSONS, LTD., Huddersfield, is a steam trap designed to return condensate to the boiler from a number of different points, although at much lower levels than the boiler and at points remote from it. For pressures up to 200 lb. per sq. in. the construction is of cast iron and for higher pressures of steel. The inlet connection is in the upper half of the body with the outlet in the lower part. A phosphor bronze spherical float is freely suspended from a fork on the stainless steel main spindle, to the external end of which is secured a lever carrying an adjustable weight.

The Hopkinson condensate return trap

A secondary spindle, carrying the mechanism that directly operates the control valve, is fitted with a quadrant and rocking arm. The latter carries a weight which rolls to the lowest end when it is tilted from the horizontal.

The control valve is operated automatically by the rising of the float which opens the trap to atmosphere, simultaneously shutting off steam during filling. When the float rises and operates the control valve, the connection to atmosphere is closed and the trap opened to boiler pressure. The disc valves are held against their seats by fluid pressure; both are of non-corrodible "Platnam." The operating spindle passes through a labyrinth gland. The trap is connected to the bottom of a cast-iron receiver with flanged ends and tapped boxes for receiving the pipes from the outlets of the apparatus to be drained.

Chlorinated Rubber

Referring to the note on this subject in our issue of September 7th; Imperial Chemical Industries, Ltd., inform us that the formula for "Alloprene" is $C_{10}H_{13}Cl$, and not $C_{10}H_{12}Cl_{17}$ as they originally stated.

The Building Exhibition

THIS year's show, which fills the Grand and National Halls at Olympia (Sept. 12th to 26th), coincides with the centenary of the Royal Institute of British Architects. It is a representative collection of constructional materials and builders' requisites, and the method of presentation is more elaborate and artistic than heretofore.

Apart from the three hundred or more commercial exhibits, the Building Research Station has a staged series of displays for the first time, and these are of considerable interest to the trade. Woodworking machine tools are prominent, all-electric examples with built-in driving motors being featured by J. Sagar & Co., Ltd., Wadkin & Co., Wilson Bros. (Leeds), Ltd., A. Cooksley, the Dominion Machinery Co., Ltd., Guilliet & Sons Co., Ltd., and Interwood, Ltd., the last mentioned including an electro-hydraulic veneering press with heating and cooling systems.

An electrically operated machine capable of making 3,000 concrete tiles per hour is shown by Pegson, Ltd., besides a portable motor-driven stone breaker. A number of electric refrigerators, service cabinets for hotels and institutions as well as domestic types, including built-in models for flats, are exhibited by Electrolux, Ltd., Frigidaire, Ltd., Kelvinator, Ltd., and the Pressed Steel Co. of Great Britain, Ltd., which has a combined refrigerator and electric cooker, while among the models of Coldair, Ltd., is a refrigerator incorporating a sink and non-cooled storage space.

On the stand of the Staines Kitchen Equipment Co., Ltd., are two large motor-driven china crockery washing machines. The display of Berry's Electric, Ltd., consists of a selection of built-in fires and "Magicoal" models with some water heaters. Belling & Co. also feature electric fires of various types with water heaters and a single cooker. A range of "Leftex" fireplaces designed to accommodate electric radiators is shown by the Leeds Fireclay Co., Ltd., and varied samples of fire surrounds are also to be seen on the stand of Slate Slab Products, Ltd.

Wooden wall brackets and pendant lighting fittings are marketed by S. Guiterman & Co., Ltd., under the trade name of "Oaklites." Neatly designed coloured-glass lighting fittings are featured by L. G. Hawkins & Co., Ltd., in addition to a selection of the smaller domestic appliances.

The stand of the General Electric Co., Ltd., is divided into five main sections devoted to an attractive range of modern lighting fittings and lamps; appliances for the kitchen and laundry; domestic fires and tubular heaters; wiring accessories and switchgear, and bells and telephones; while the centre is an architectural feature demonstrating colour-flood-lighting by means of "Osira" lamps.

Pentesales demonstrate the violet-ray properties of "Neron-Vitalux" artificial sun lamps.

A joint exhibit by members of the Cable Makers' Association is generally representative of the various types of cables used for lighting and power installations, and special house wiring system.

Butters Bros. & Co. have an example of an electrically operated Scotch derrick crane, and the Flextol Engineering Co., Ltd., a selection of tools which are power-driven through flexible shafting, while Hammond Bros. & Champness (1933), Ltd., feature push-button controlled passenger and service lifts.

E. P. Allam & Co., Ltd., show a motor-driven friction winch and an electrical machine for vibrating concrete *in situ*; it is loaded to 300 W, is portable, and has special fittings for clamping to suit the different methods of use.

Morris Heating Appliances, Ltd., exhibit plug-in portable water radiators, while Thermidair radiators are also movable. Henry Hope & Sons, Ltd., have electrically controlled ventilator opening gear and motor-driven automatic stokers for central-heating plant.

Motor-driven air-compressor-type paint spraying outfits are on the stands of B.E.N. Patents, Ltd., Aerostyle, Ltd., Lacy-Hulbert & Co., Ltd., Kurt Erlach, Ltd., and Coldair, Ltd.

The Central Equipment, Ltd., shows the no-mast radio aerial and "Siltit" earth. Smith's English Clocks, Ltd., display a varied selection of mains-operated electric clocks.

The Reliance Telephone Co., Ltd., has a new instrument for intercommunication in offices and hotels as well as private residences. Although working from an automatic exchange, dialling is not necessary and there is no need to hold a receiver. By throwing a switch mounted on the base of the instrument, a loud speaker and sensitive microphone are brought into operation, so that replies are heard aloud and the voice is picked up by the microphone even at some distance from the actual instrument, which gives full secret intercommunication with any number of lines from 10 to 10,000, requires only a twin wire to connect, and occupies very little space, approximately 7 in. square.

The New London Pavilion. **(See page 388)**

(1) The entrance vestibule. (2) The café showing the "Tubelamp" fittings. (3 and 4) The concealed lighting of the auditorium

British Overseas Electrical Trade

The improvement continues

ENCOURAGING figures as far as the electrical industry is concerned are contained in the Board of Trade returns for August. The total value of electrical goods, apparatus and machinery exported was £889,086, representing an increase of £189,122 (or 27 per cent.), compared with the corresponding month of 1933. The percentage increase was slightly higher than in July.

The chief contribution to the increase was made by electric generators, with a rise of nearly 220 per cent. There were also substantial advances in many of the other main categories.

With regard to imports the increase was approximately 33 per cent., radio apparatus being mainly responsible for the rise. The percentage increase was lower than in July, when it stood at 57.

The table given below shows the destinations of the four principal classifications, but the following brief analysis of a few of the smaller items is of interest:—

Rubber-insulated wires and cables: Australia, £21,233 (£11,497); South Africa, £17,905 (£13,206); India, £13,550 (£11,830); New Zealand, £4,320 (£1,283); other British countries, £13,819 (£16,125); foreign countries, £6,655 (£5,254).

Electric wires and cables (insulation other than rubber): South Africa, £18,854 (£14,636); Australia, £12,200 (£4,749); India, £11,651 (£16,669); other British countries, £12,640 (£7,517); foreign countries, £8,801 (£6,001).

Telegraph and telephone apparatus (not radio): South Africa, £17,476 (£24,880); Australia, £12,642 (£6,649); Canada, £469 (£32); other British countries, £13,129 (£22,360); Argentina, £4,110 (£634); other foreign countries, £31,621 (£46,555).

The following analysis shows the sources of electrical imports into this country:—United States, £87,520 (£41,299); Netherlands, £72,782 (£49,910); Germany, £58,555 (£64,780); Switzerland, £18,988 (£17,807); France, £16,058 (£8,676); British countries, 14,522 (£9,801); Belgium, £5,515 (£10,707); Austria, £4,996 (£4,640); other foreign countries, £32,248 (£27,618).

Vacuum cleaners were supplied by the following:—Sweden, £4,120 (£802); United States, £1,403 (£825); Germany, £317 (£542); Canada, £153 (£2,056); other foreign countries, £973 (£1,076).

EXPORTS AND IMPORTS DURING AUGUST

	Exports. Aug., 1934.	Exports. Inc. or dec. compared with Aug., 1933.	Imports. Aug., 1934.	Imports. Inc. or dec. compared with Aug., 1933.
Submarine telegraph and telephone cables	£6,463	– £8,100	*	—
Telegraph and telephone wires and cables (not submarine)	21,480	– 22,795	*	—
Other insulated wires and cables	141,628	+ 32,861	£16,550	– £7,113
Radio receivers (excluding valves)	21,181	+ 9,282	55,160	+ 43,367
Radio transmitters (excluding valves)	24,162	+ 13,087	*	—
Radio valves	27,029	+ 7,765	17,006	+ 2,723
Other radio parts and accessories	44,723	+ 21,985	78,152	+ 20,237
Telegraph and telephone apparatus (other than radio)	79,447	– 21,663	*	—
Electric carbons	*	—	14,759	– 881
Incandescent lamps	40,671	+ 7,769	9,599	– 7,350
Other lighting apparatus	34,049	+ 9,386	42,154	+ 14,166
Primary batteries	13,203	– 6,990	990	+ 621
Accumulators	30,381	+ 752	*	—
House service meters	11,979	+ 1,826	*	—
Other electrical instruments	12,036	– 510	25,338	+ 996
Unenumerated electrical goods and apparatus	112,668	+ 32,769	51,476	+ 9,180
Electric generators up to 200 kW.	13,957	+ 3,941	*	—
Electric generators over 200 kW.	73,361	+ 56,082	*	—
Electric motors	58,308	+ 11,017	16,193†	+ 4,264
Convertors and transformers	28,826	+ 14,723	*	—
Starting and controlling gear for motors	26,792	+ 7,733	*	—
Switchgear	58,929	+ 19,340	*	—
Other electrical machinery	7,813	+ 1,138	12,810	+ 4,683
Electric vacuum cleaners	*	—	6,966	+ 1,660
	£889,086	+ £189,122	£347,153	+ £86,553

* Not classified separately. † Not railway and tramway motors.

BRITISH ELECTRICAL EXPORTS DURING AUGUST

Destination.	Goods and apparatus, Aug., 1934.	Inc. or dec. compared with Aug., 1933.	Electric generators, Aug., 1934.	Inc. or dec. compared with Aug., 1933.	Motors, Aug., 1934.	Inc. or dec. compared with Aug., 1933.	Other electrical machinery, Aug., 1934.	Inc. or dec. compared with Aug., 1933.
Irish Free State	£31,619	+ £4,452	*	—	*	—	*	—
Union of South Africa	107,552	+ 14,700	£35,895	+£32,017	£10,230	– £7,959	£40,012	+£23,225
British India	70,625	– 4,486	7,716	+ 5,115	6,752	+ 3,066	21,701	+ 2,497
British Malaya	14,114	+ 7,290	*	—	*	—	3,346	+ 1,823
Ceylon	5,298	+ 1,500	*	—	*	—	*	—
Hong Kong	2,681	– 11,423	*	—	*	—	*	—
Australia	87,354	+ 46,793	14,066	+ 12,190	6,270	+ 3,005	10,946	+ 5,137
New Zealand	33,789	+ 9,845	*	—	2,137	– 1,037	988	– 4,115
Canada	6,176	+ 1,507	5,373	+ 5,064	3,146	+ 1,186	1,491	+ 1,067
Other British Countries	45,456	– 8,117	18,440	+ 5,981	12,966	+ 6,347	18,862	+ 9,066
Sweden	9,414	+ 3,609	*	—	*	—	*	—
Denmark	11,404	+ 2,774	*	—	*	—	*	—
Belgium	10,023	+ 4,736	*	—	*	—	*	—
France	9,628	– 3,027	*	—	*	—	2,328	+ 315
Spain	16,482	– 336	*	—	*	—	*	—
Italy	2,216	– 5,749	*	—	*	—	*	—
Greece	4,919	+ 3,418	*	—	*	—	*	—
Egypt	8,782	+ 4,006	*	—	*	—	2,535	– 5,153
China	8,453	– 17,626	*	—	*	—	4,660	+ 3,068
United States	2,193	+ 1,062	*	—	*	—	*	—
Argentina	15,676	+ 6,305	*	—	*	—	924	+ 72
Soviet Union	*	—	40	+ 40	3	– 558	—	– 107
Netherlands	*	—	56	+ 56	539	+ 213	560	– 91
Other Foreign Countries	116,946	+ 16,191	5,732	– 440	16,265	+ 6,754	14,007	+ 3,854
Total	£621,100	+£77,424	£87,318	+£60,023	£58,308	+£11,017	£122,360	+£40,668

* Not classified separately.

New Books

Wasserkraftanlagen. Vol. I. By DR.-ING. ADOLF LUDIN. Pp. 516; figs. 603. Berlin: Julius Springer. Price Rm. 33.50.

This book forms one of the series of civil engineering manuals edited by Dr.-Ing. Robert Otzen. It fully maintains the high standard of excellence established by other volumes in the "Handbibliothek für Bauingenieur" series. Its special interest to electrical engineers is that, for all practical purposes, water power developments are now hydro-electric plants, and pumped-storage forms an attractive method of dealing with the peak load problem wherever a suitable basin is available or can be formed. In this the first half of the work, the author deals with the basic principles and methods of water power development, economic and technical considerations, and details of hydraulic and power station construction, finishing with brief notes on electric generators and transmission lines. The second volume, to be published next year, will deal mainly with dams and storage.

The author stresses the permanent addition to national wealth to be derived from the proper development of water power and, equally, the permanent injury that may result from injudicious schemes. The resources and responsibilities of engineers increase with every addition to the ways and means of hydro-electric development and with every increase in the demand for electrical energy. These principles are kept well to the fore in this comprehensive treatise which should prove equally valuable to students specialising in the subject and to engineers in practice.

Considering how often hydro-electric schemes have to be surveyed and developed far from reference libraries and other sources of information, it is satisfactory to have in one volume a presentation of even the most elementary principles and formulæ leading up to the complete solution of practical problems and supplemented by data and drawings from projects all over the world. The vitally important problems of planning are dealt with in an extraordinarily thorough manner, and although the author is primarily concerned with the design and layout of the plant he also deals fully with the practical aspects of construction.

* * *

Shorter Notices

"Quality in Rubber Cables," by P. Dunsheath, M.A., D.Sc., M.I.E.E. Pp. 48. London: W. T. Henley's Telegraph Works Co., Ltd.—A reprint, including the subsequent discussion, of a paper read before the London Branch of the Association of Mining Electrical Engineers.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures

Key Industry Duty Exemptions

The Board of Trade has under consideration the question of the renewal of the Order exempting the following from Key Industry Duty:—Mercury-vapour rectifiers having mercury cathodes, of a capacity of more than 200 A and having more than three main anode terminals. Amorphous carbon electrodes over 3 ft. long the cross-section of which exceeds 12 in. in both length and breadth with longitudinal slots exceeding 2 in. in width and 4 in. in depth. The present Order exempts these goods from duty until the end of the year. Any communications regarding the matter should be addressed to the Principal Assistant Secretary, Industries and Manufactures Dept., Board of Trade, Great George St., S.W.1, by Oct. 13th.

A Croydon Electric Home Exhibition

An Electric Home Exhibition, organised by the Croydon Corporation Electricity Department, was to be opened by the Mayor of Croydon yesterday (Thursday) afternoon.

New "Northmet" Showrooms

The new showrooms and offices of the North Metropolitan Electric Power Supply Co. in Station Road, Wood Green, were to be formally inaugurated yesterday (Thursday) by the Deputy-Mayor of Wood Green. The new premises are the largest of the company's twenty-eight showrooms.

Duty on Braid

The Import Duties Advisory Committee gives notice of an application for an increase in the import duty on plaited tubular braids and plaited cords, not exceeding 1 in. in circumference, with or without a centre filling, including such braids which have been varnished or otherwise prepared for use as electric insulating sleeving; but not including tubular braids or cords containing a metal or rubber core. Any representations which interested parties may desire to make with regard to this application should be addressed in writing to the secretary of the Committee, Caxton House (West Block), Tothill Street, Westminster, S.W.1, not later than October 8th.

Local Exhibition

A study in green is the Plymouth Corporation Electricity Department's stand at the Modern Homes, Health and Food Exhibition in the Guildhall, Plymouth, which remains open until to-morrow (Saturday). Against a background and flooring of marbled green are to be seen bathroom geysers, cookers, fires and other electrical appliances all finished in the same soft shade, the whole forming a blend of the artistic and practical which has drawn the attention of thousands of people since the exhibition opened.

Two Carnival Tableaux

We show in the accompanying illustration a lorry which was decorated by members of the staff of the Mid-Lincolnshire Electric Supply Co., Ltd., and entered for the recent carnival

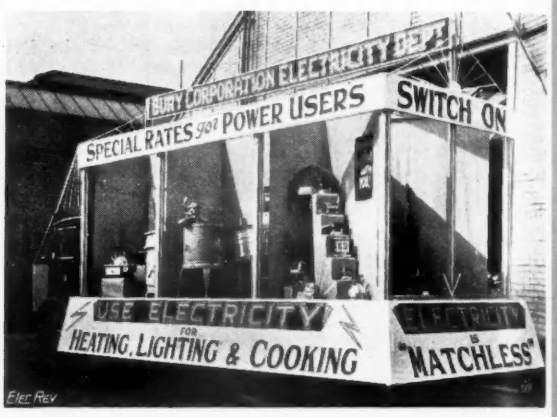
An electrical tableau by the Mid-Lincs Co., at the Mablethorpe Carnival

at Mablethorpe. This tableau gained second prize, a commendable effort, as there was a large entry in the industrial class.

The accompanying illustration shows a lorry decorated by the staff of Bury Corporation Electricity Department and entered for the recent carnival held in Bury. This attractive display gained the first prize (a silver cup). The general scheme was outlined blue lettering on a white background except in the case where the word "Electricity" was used, this being in red. The main background was in light blue cloth.

Australian Duties on Dynamos and Transformers

The Australian Tariff Board has issued a report regarding the duties on dynamo electric machines and static transformers. The Government has adopted the recommendations which the Board found would be fair rates of duty if the exchange were at par. The effect is to avoid any alteration in the rates of



Bury Electricity Department's carnival tableau

duty which are now being applied. Because of the adjustments made last year in making the general reduction in the British preferential rate to compensate for the protective incidence of the exchange, the rates of duty now in force under the preference are broadly the same as the proposed new rates recommended by the Board as being applicable to the existing conditions. As the rates in the general tariff were not adjusted last year to take account of the exchange situation, and as the new general rates recommended by the Board have been rejected, goods from foreign sources will be taxed at a rate considerably above that recommended by the Board, and the margin of preference in favour of British goods will thereby be increased. Referring to dynamos, the Board recommended that according to the type, rates under present exchange conditions should be 30 per cent. and 5 per cent. British preference and 50 per cent. and 25 per cent. general. On static transformers they recommended 30 per cent. British and 50 per cent. foreign. These adjustments are already in operation.

Canadian Trade Commissioner's Visit

The Department of Overseas Trade announces that Mr. F. W. Field, C.M.G., Senior Trade Commissioner in Canada, is at present in this country on an official visit. Mr. Field will be available at the Department on September 24th for the purpose of interviewing manufacturers and merchants interested in the export of United Kingdom goods to Canada after which he will visit a number of industrial centres in the provinces. Firms desiring an interview with Mr. Field in London or information regarding his arrangements to visit provincial centres should apply to the Department, 35, Old Queen Street, London, S.W.1, quoting Reference 11952/1934.

Colonial Customs Tariffs

The Department of Overseas Trade draws attention to the issue by the Colonial Office of a publication entitled "Customs Tariffs of the Colonial Empire." This publication contains the full text of the Customs tariffs of all the British overseas dependencies as in force on July 1st, 1934, together with the definition of value for duty purposes in each colony. It is issued in three parts, as follows:—Part I, Africa (2s. 6d. net); Part II, Eastern, Mediterranean and Pacific (3s. 6d. net); Part III, West Indies (3s. 6d. net). All three parts are on sale and may be purchased from H.M. Stationery Office. Leaflets showing additions and amendments will be published from time to time.

Radio Production in France

It is announced that the French subsidiary of the Dutch Philips Co. intends to take up the manufacture in France of all radio accessories which have hitherto been imported.

Free State Duty on Lamps

The Irish Free State Government has imposed a duty of 75 per cent. *ad valorem* on "electric filament lamps consuming not more than 500 watts, but excluding electric lamps which are, in the opinion of the Revenue Commissioners, designed, constructed and intended for use in hand lamps

energised from a dry battery or for use exclusively for scientific or for medical or surgical purposes." The emergency duty of 20 per cent. does not apply to these lamps and the authorities may grant exemptions from the new duty in certain cases.

Electricity Refused at Chard

The Chard (Somerset) Town Council was recently approached by the South Somerset and District Electricity Co., Ltd., with regard to its decision not to permit the installation of electricity in some local Council houses. At a meeting of the Council it was stated that the reason for the ban was the expense to which the Corporation Gas Department had been put in laying mains to the estate. The Council declined to reconsider its decision.

Social Events

At Walkden, near Manchester, on September 8th, the staff of the Lancashire Electric Power Co. competed with teams of the S.W. & S. Electric Power Co. at cricket, tennis and bowls. In the cricket match the L. E. P. scored 88 runs, but this total was passed by the S. W. & S. who scored 117. At tennis the L. E. P. beat their opponents by nine matches to four, and on the bowling green the L. E. P. men won comfortably by 231 to 119 points. Luncheon was served in the marquee and Mr. C. D. Taite, manager and director of the L. E. P. Co., who welcomed the visitors, expressed the hope that the meeting was only the first of a series of similar sports events between the two companies. He regretted that Mr. J. T. H. Legge, the managing director of the Shropshire, Worcestershire and Staffordshire Co. had found it impossible to be present owing to pressure of business. Mr. R. C. Leslie, mains superintendent, seconded and supported Mr. Taite's remarks. Replying for the visitors, Mr. L. Howles, general manager of the S. W. & S. Co. expressed on behalf of his men their appreciation of the welcome extended to them, and Mr. Bird supported this reply.

Members of the cricket, tennis, and bowls teams of the L.E.P. Co., and the S.W. & S. Co. Our readers will recognise Mr. C. D. Taite and Mr. L. Howles in the centre of the group

The Ipswich Branch of the General Electric Co., Ltd., held its annual outing on September 8th in perfect weather, going by road to East Runton. Bathing and beach sports were indulged in, and after lunch, served at the Four Winds Café, the party went on to spend a festive evening at Great Yarmouth, eventually returning to Ipswich in the early morning.

Before a large gathering the annual swimming gala of the G.E.C. Social and Athletic Club was held at the Holborn Baths on September 14th. The winners of the chief events were as follows:—The Sir Hugo Hirst Challenge Cup (210 yards), D. Lavarack; the ladies relay race (Mrs. L. C. Gamage cup), Osram team; men's relay race (Mr. L. C. Gamage cup), Head Office; in the ladies' diving competition (Lady Hirst Cup), Miss H. Roberts and Miss Tolmie. An outstanding item of the programme was a display of fancy swimming by a team of ladies from the Pearl Insurance Co. In the polo match the G.E.C. beat Unilever by five goals to three. Mrs. L. C. Gamage, president of the Club, presented the prizes at the conclusion of the races.

The Amateur Mixed Swimming Club of Messrs. A. Reyrolle & Co., Ltd., recently held its annual swimming gala, and in the accompanying illustration we show some of the competitors. The club has over 300 members and the event proved a great attraction, the baths being packed with employés and their friends.

Competitors at the recent Reyrolle swimming gala

German Electrical Imports and Exports

The official returns show that the imports of electrical machinery and apparatus into Germany during the six months ended with June last attained a value, taking German marks at 12.85 to the £, of £1,000,625, as compared with £815,795 in the corresponding half of 1933. The exports of similar material from Germany amounted to £8,100,855 as against £8,994,855 in the corresponding period of 1933.

Price Reductions

The Telegraph Condenser Co., Ltd., announces reductions in prices of its low and medium voltage dry electrolytic condensers and tubular paper condensers as from October 1st.

The Marking of Radio Apparatus

The Board of Trade announce that the Standing Committee (General Merchandise) has reported on its inquiry as to whether the following classes and descriptions of imported goods should be required to bear an indication of origin:—I. Radio receiving sets, radio gramophones, electrical gramophones, electrical audio frequency amplifiers; whether imported complete or in parts; and II. The following components and accessories for any of the goods included in I: Battery eliminators; chokes; condensers; drives for variable condensers; electrical gramophone pick-ups; volume controls; electrical gramophone motors; gramophone turntable units comprising an electric motor and a turntable; headphones; loud speakers; loud speaker units; resistances; valve holders and adaptors; transformers; tuning coils; resistance capacity coupling units; choke capacity coupling units; chassis or frame carrying, or adapted to carry, a collection of components. The report is being published, and may shortly be purchased from H.M. Stationery Office.

Smoot Combustion Control

The Grace Engineering Co., Ltd., of 148, Leadenhall Street, London, E.C., has secured the Empire and European agency for the Smoot combustion control system which has been installed for both large and small boiler plants in the United States, while several Smoot regulators are also in operation in London for various duties. The company, which intends to manufacture the apparatus in this country later, will shortly erect a demonstration set at the address mentioned.

International Combustion, Ltd.

International Combustion, Ltd., of Aldwych House, Aldwych, W.C.2, announces that it has purchased the share capital of the Riley Stoker Co., Ltd., of 9, Bridge Street, S.W.1. The change of control involves no alteration in the policy of the Riley Stoker Co., which will continue, as heretofore, to market the various classes of stokers in which it is interested, as the purchase includes all patterns, patents, designs and goodwill. The management of the Riley Stoker Co. has been placed by International Combustion, Ltd., in the hands of Mr. H. J. Edmunds, who will operate with the existing staff from the offices of the Stoker Co.

Housekeeping in Autumn

We have just received from the Electrical Development Association a copy of the Autumn Number of its publication *Electrical Housekeeping*. The contents include an account of an interview with the Marchese Marconi on "Radio and the Future," followed by articles on "Colour as Life Force," "What Shall We Eat?," electrical equipment for the small house and the lighting of such residences, electric sewing machines, and methods of protection against burglary.

Portstewart Council Fined

At Coleraine (Co. Londonderry) recently Mrs. King, of Portstewart, summoned the Portstewart Urban Council for failing to give her a supply of electricity on request. It was stated for the plaintiff that upon returning to Portstewart, where she formerly resided, she asked for a supply of electricity and was told by the Town Clerk that an outstanding account would have to be settled first. This amount was paid but the Council still failed to provide a supply.

The Town Clerk said that he had expressed the Council's

willingness to commence to supply upon Mrs. King undertaking to conform with the Council's regulations.

The magistrates decided to convict and imposed a fine of 5s. per day from the date of the hearing until the supply was given. They also allowed costs of £1. Notice of appeal was given on behalf of the Council.

Recent Contracts

The English Electric Co., Ltd., has recently secured a number of orders for oil-engine generating plant. The more important contracts received include the following:—A complete generating station for the Admiralty, comprising three 1,500-h.p. oil engines, each direct-coupled to a 1,000-kW generator; two 400-h.p. oil engines, each direct-coupled to a 270-kW generator, together with transformers, switchgear, control panels and all accessories for a complete power station (also for the Admiralty); two 1,500-h.p. oil engines, each direct-coupled to a 1,000-kW generator; one 750-h.p. engine, coupled to a 500-kW alternator, together with all accessories, for the War Office; a 875-h.p. oil engine, direct-coupled to a 690-kVA alternator, for the Gokak Mills, India; a 750-h.p. oil engine, direct-coupled to a 500-kW alternator for the West Devon Electric Supply Co., Ltd., for installation at Mary Tavy; a 625-h.p. oil engine, direct-coupled to alternator, for Bideford & District Electric Supply Co.; a 625-h.p. oil engine, direct-coupled to a 430-kW alternator, for the South of England; two 300-h.p. oil engines, direct-coupled to alternators, for installation in the West End of London; and other engines of various sizes for Australia and India.

Trade Announcement

Sterilizair, Ltd., have removed to 11, Queen Victoria Street, E.C.4 (telephone: City 3340).

A Fire Window Display

As our illustration shows the new fire display frieze prepared by the Simplex Electric Co., Ltd., for the coming

A Simplex electric fire display

season is very effective, and electrical contractors who wish to avail themselves of this setting can obtain further particulars on application to the nearest branch of the company.

Cable Company Fined

A *Reuter* message from Athens states that a fine of £21,900 has been imposed by M. Dino Tsalaris, Greek Under-Secretary of Communications, on the Eastern Telegraph Co., for an alleged failure to meet its contractual obligations. It is alleged by the Ministry of Communications that the company suspended direct communication with Egypt for a period of 280 days and with Turkey for 300 days. The company's directors, it is announced, are to be held personally responsible for payment of the fine. The company has also received what is described as a strongly-worded communication from the Ministry instructing it to retain a Greek staff, and threatening that otherwise the company's alien staff will be expelled.

Prices of Materials

Messrs. F. Smith & Co. report, September 19th: No change in the price of electrolytic copper bars, wire rods and h.c. wire and silicium bronze wire.

Messrs. James & Shakespeare report, September 19th: No change in the price of copper bars (best selected), sheet and rod. English pig lead, £12 10s., 5s. increase. Electrolytic copper sheets, £30 5s. to £30 15s., 5s. decrease.

Messrs. Edward Till & Co. report, September 19th: India-rubber, Para fine, 5¼d., ¼d. increase.

The Australian Ever Ready Co.

The Every Ready Co. (Gt. Britain), Ltd., announces that developments in Australia have necessitated the reformation of its Australian company with increased capital. The title of the new company is Ever Ready Co. (Australia), Ltd., and it has a nominal capital of £250,000.

Works Visit

A party of 110 members of the Institution of Production Engineers, headed by their general secretary, Mr. P. Hazelton, paid a visit to the E.M.I. Works at Hayes, Middlesex, on September 18th, where they saw the production of gramophones and radio instruments. The party was welcomed by Mr. W. A. Fraser, assistant production manager, himself a member of the Institution. After the two hour tour of the works, which ranged from the record factory to the cabinet factory, which alone is turning out some 2,000 cabinets a day of twenty-four types to meet the demands of the radio assembly building, which was also inspected, the guests were entertained to tea, where they were joined by Mr. H. W. Healy, the works manager, and Mr. W. T. Force, controller of factories.

An Air-travel Guide

The "Airway Time Table," a copy of which has been sent us by the Roadway Publications, Polebrook House, Golden Square, London, W.1, is a complete guide to British and Continental air services, giving times, fares and conditions. It is published monthly and costs 4s. 6d. a year post free.

A Holophane Conference

A considerable company of electrical contractors from all over the British Isles attended a conference last week at Messrs. Holophane, Ltd., Elverton Street, S.W.1. Lectures given by Dr. S. English, head of the Research Department, Mr. E. Stroud, chief engineer, and Mr. L. M. Tye, industrial lighting engineer, were followed by discussion. In the afternoon a colour lighting show was given in the Holophane theatre. The conference served to introduce a number of new units that have just been placed on the market, and at its conclusion a dinner was held at the Criterion Restaurant, when Mr. H. H. Thompson presided.

R. A. Lister & Co.'s Extensions

In order to cope with the increased demand for private lighting equipment, Messrs. R. A. Lister & Co., Ltd., have doubled their manufacturing plant, and further extensions to their works are now in hand. During recent months the company has increased its staff by over 50 per cent.

Polish Electrical Imports

During June last the value of "electrical machinery, apparatus, implements and parts" imported into Poland was 1,067,000 zloty (about £37,000).

New Catalogues and Lists

A. P. Lundberg & Sons, Ltd., 477 to 489, Liverpool Road, Holloway, N.7.—Leaflet EI.110, dealing with a new switch for the control of neon lighting.

Alexander Wright & Co., Ltd., 1, Westminster Palace Gardens, S.W.1.—A well-produced catalogue describing Simmance patent pressure and vacuum recorders and indicators, together with a price list.

Brookhirst Switchgear, Ltd., Northgate Works, Chester.—Publication No. 429, containing brief particulars of automatic feeder voltage regulators.

The Mirrlees Watson Co., Ltd., 45, Scotland Street, Glasgow.—Leaflets Nos. P.1095 and P.1096, dealing respectively with foundry blacking mixing plant and centrifugal pumps.

John Dugdill & Co., Ltd., Hazel Grove, near Stockport.—An abridged list of movable, focusing, self-sustaining lighting fittings for industrial and other lighting.

Elliott Bros. (London), Ltd., Century Works, Lewisham, S.E.—Catalogue sheets C39/40, relating to the company's kVA indicator (Shotter patent), and T5/6, describing its system of remote indication of watts, kVA, and reactive kVA.

Dubilier Condenser Co., Ltd., Ducon Works, Victoria Road, North Acton, W.—A booklet giving prices and particulars of condensers and resistances.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.—Publication OS.6090, giving illustrated descriptive particulars of a 9-kW aerodrome landing floodlight.

A.E.G. Electric Co., Ltd., 131, Victoria Street, S.W.—A folder containing brief particulars of a.c. motors.

Bulpitt & Sons, Ltd., Swansea Works, Birmingham.—An illustrated folder relating to the "Swan" brand electric fires.

Simplex Electric Co., Ltd., 159, Great Charles Street, Birmingham.—The 1934-35 catalogue of "Creda" electric fires, illustrated in colour.

Bankruptcy Proceedings

S. S. West and **L. A. Brown,** trading as Webro Electrical Contractors, electrical engineers, 41, Goodge Street, W.—A sitting of the London Bankruptcy Court was held on September 11th for the public examination of these debtors who failed in July with liabilities of £1,965 and assets of £140. The Official Receiver reported that the debtor Brown had not surrendered to the proceedings, and his present whereabouts were not known to the department. Replying to the Official Receiver, the debtor West said he and Brown started business in June, 1932, under the above style at Lichfield Road, Bow. They carried out general electrical installation and repair work, removing in August, 1932, to Upper Rathbone Place and thence to Goodge Street in the following November. The trading was unsuccessful from the outset, and since November, 1932, had been carried on by means of considerable loans from friends and a bank overdraft. Creditors had pressed since January, 1933; judgment for £68 was obtained against the firm in February, 1934, and these bankruptcy proceedings followed. Brown left the business in April, and witness thereupon closed down, the stock and fittings having been seized by the landlord under a distress for rent. The debtor attributed the failure of the firm to lack of capital, loss in trade due to heavy expenses, bad debts, and mismanagement by his partner in respect of the office and contracts undertaken by him, thus resulting in the loss of orders. The examination of West was concluded.

C. E. Keates, electrical contractor and engineer, Brent Street, Hendon, N.—The statutory first meeting of creditors was held last week at London Bankruptcy Buildings. The receiving order

was made on the petition of Falk, Stadelmann & Co., Ltd. According to the debtor's statements he began business on his own account in 1919 at Bell Lane, Hendon, and subsequently carried it on at various places in Brent Street, Hendon, and Fortune Green Road, N. The overhead charges exceeded the profits and he has been handicapped by an illness extending over considerable periods during the past four years. In June C. E. Keates, Ltd., was formed to take over the business and he was appointed to the post of managing director. The debtor roughly estimates his liabilities at £3,000 against assets £1,100, and further attributes his failure to bad trade and depreciation in the value of wireless stock. The meeting was adjourned for a week with a view to the appointment of a trustee.

C. E. Tong, 6, Fishergate, York, electrical engineer.—The public examination herein took place recently at York. The

A corner of Messrs. Greene, Phillips & Co.'s new showrooms at First Avenue House, High Holborn, W.C.

liabilities were stated to amount to £207, and there was a deficiency of £161. Debtor said that his work consisted chiefly of installing electricity in York and district. During the last twelve months the business had declined as the result of his ill-health. Lack of capital and keen competition had also contributed to his failure. The examination was concluded.

J. Watkins, 25, Bailey Street, Brynmawr, Brecknockshire, radio dealer.—The first meeting of creditors herein was held at 34, Park Place, Cardiff, on September 7th. The statement of affairs showed liabilities of £237, and net assets of £96. Debtor said his failure was due to local trade depression, re-diffusion of wireless programmes, and bad debts. The case being a summary one was left in the hands of the Official Receiver, as trustee.

H. C. Vanson, 35, Pasture Road, Goole, electrical engineer.—The receiving order herein was made on the debtor's own petition. The first meeting of creditors was held recently at the Official Receiver's Office, 13, Burton Street, Wakefield, when the case being a summary one was left in the hands of the Official Receiver, as trustee.

H. W. W. Alford, wireless engineer, 13, Goldsmith Street and 261, High Street, Exeter.—Last day for receiving proofs for dividend September 26th. Trustee, Mr. W. R. Cocks, Exeter Bank Chambers, Broadgate, Exeter, Official Receiver.

S. Colbert, electrician and wireless dealer, 350, Kirkstall Road, Leeds.—Last day for receiving proofs for dividend September 25th. Trustee, Mr. H. C. Bowling, 24, Bond Street, Leeds, Official Receiver.

T. J. Matthews (Universal Radio), wireless dealer, 40, Rumbridge Street, Totton.—First meeting September 18th at 10, Rockstone Place, Southampton. Public examination October 17th at the Court House, Southampton.

A. L. Pearce, electrical supplies dealer, 12, Fore Street, Newquay.—First and final dividend of 4s. 8¾d. in the £, payable September 20th, at 12, Princes Street, Truro.

N. V. Dixon, electrical contractor, 6, Tong Street, Dudley Hill, Bradford.—Receiving order made September 8th on debtor's own petition. First meeting, September 21st, at 71, Manningham Lane, Bradford. Public examination, October 24th, at the County Court, Bradford.

B. S. Jones (North Wales Battery Service), Buxton House, Barmouth.—First meeting September 22nd and public examination October 11th, both at 3, Baker Street, Aberystwyth.

R. E. Young, wireless and electrical engineer, 8, Manchester Road, Swindon.—Discharge suspended for six months until February 15th, 1935.

S. A. Sears, radio engineer, 98, High Street, Redbourn.—Last day for receiving proofs for dividend October 1st. Trustee, Mr. J. S. B. Hole, 240, High Holborn, W.C.

Company Liquidations

R.R., Ltd., manufacturers and wireless, electrical and scientific apparatus and accessories, 41, Newcomen Street, Borough, and Eastnor House, Lloyds Place, Blackheath.—The accounts lodged under the compulsory liquidation of this company show total liabilities of £23,137 (ranking £8,965), assets £14,171 (absorbed in preferential and debenture claims), and a deficiency of £33,915 with regard to contributories, the issued capital amounting to £24,950. Mr. J. Barwick Thompson, Official Receiver, reports that the company was formed in July, 1929, as a private company and up to March, 1931, earned profits amounting to approximately £14,643. In June, 1931, a prospectus was issued to the public, particularly to customers, business contacts and acquaintances, and as a result subscriptions were received for 25,420 ordinary and 12,110 preference shares all of 1s. each. With the capital thus subscribed the company in August, 1931, acquired the freehold property Eastnor House and the plant, machinery and furniture therein for £5,500. In July, 1932, the directors purchased another freehold factory, Aerial Works, Blackheath, with the plant, machinery, &c., for £9,350. Part of the machinery not required was sold and the properties and their contents are now expected to realise £12,000. It is stated by F. T. Pankhurst and I. W. Ernest Hustler (two of the promoters and directors) that they commenced business in 1927 as mail order suppliers of wireless components under the style of Ready Radio Supply Company and that R.R., Ltd., was incorporated for the purpose of taking over that business. In August, 1931, the company issued to its bankers a charge on Eastnor House to secure advances not exceeding £3,600, and in July, 1932, the company issued a debenture to secure further advances not exceeding £12,000. The money appears to have been used to purchase Aerial Works and to finance an increase in sales under hire-purchase agreements. In January, 1934, the directors realised that they were unable to continue to carry on the business and the bankers appointed Mr. S. H. Gillett, C.A., as receiver on their behalf. There appears to be no possibility of any funds becoming available for the benefit of the unsecured creditors. The failure of the company is attributed by the directors to the action of a group of the large radio manufacturers in restraining wholesalers from handling the company's products, and to decline in the radio trade from September, 1932, to the end of 1933. In the opinion of the Official Receiver the failure is further attributable to mismanagement on the part of the directors in that they permitted the company to embark upon an ambitious programme of manufacturing wireless goods and accessories without satisfying themselves that there was an available market for the goods so manufactured. Mr. S. K. Tubbs, C.A., has been appointed to the post of liquidator.

Lumena, Ltd.—Particulars of claims by October 20th to the liquidator, Mr. A. W. Macredie, Orchard Chambers, Church Street, Sheffield.

Electric Advertising Clocks, Ltd.—Meetings October 22nd at 16, South Street, E.C., to receive an account of the winding-up by the liquidator, Mr. W. T. Piggott.

Sterling Batteries, Ltd.—Particulars of claims to be sent by October 16th to the liquidator, Mr. P. S. Booth, Kimberley House, Holborn Viaduct, London, E.C.

Hamilton Beach Sweepers, Ltd.—Meetings of members and creditors October 15th at 3, London Wall Buildings, London, E.C.2, to receive an account of the winding-up by the liquidator, Mr. E. G. Evans.

Daventry & Co., Ltd.—Winding up voluntarily. Liquidator, Mr. C. W. Callow, 18, Winckley Square, Preston.

Dissolutions of Partnership

Charleson Accumulator & Electrical Engineering Co., electrical engineers and accumulator manufacturers, 136, St. George's Road, Bolton.—Mr. W. Brown and Mary J. Dawson have dissolved partnership. Mary J. Dawson will attend to debts and carry on the business.

Leslie Baker & Co., radio and electrical engineers, 21, Brentgood Street, Bury St. Edmunds.—Messrs. L. G. Baker and L. W. Smith have dissolved partnership. Mr. Baker will attend to debts and carry on the business.

Swift Radios, wireless dealers, 698, High Road, Leytonstone, E.—Messrs. L. Isaacs and A. Pearl have dissolved partnership. Mr. Pearl will attend to debts and carry on the business.

J. Ball & Co., electricians and wireless dealers, 34, Rawmarsh Hill, Parkgate, near Rotherham.—The partnership between Messrs. J. Eyre, J. A. Ball, R. Henfrey, and A. E. Pike has been dissolved so far as concerns Mr. Pike, who retires from the firm.

Elko Radio Co., wireless engineers, 27, King Street, Twickenham.—Messrs. V. A. Halford and E. E. Victor-Halford have dissolved partnership. Mr. V. A. Halford will attend to debts and carry on the business.

Winding-up Petition

A. S. Plater & Co., Ltd.—A petition for the winding-up of this company has been presented to the High Court by the General Electric Co., Ltd., and will be heard in London on October 8th.

Reduction of Capital

Kolster-Brandes, Ltd.—A petition for the confirmation of the reduction of capital from £1,300,000 to £483,800 has been presented to the High Court and will be heard in London on October 8th.

THE MID-CHESHIRE ELECTRICITY SUPPLY CO. LTD.
USE ELECTRICITY
THE HOME THE FARM & ALL WAYS
LIGHTING. HEATING. COOKING. COOLING & HOUSEWORK
USE ELECTRICITY

The Mid-Cheshire Electricity Supply Co.'s stand at the recent Middlewich, Ches., show

Electricity Supply

Lighting, Domestic, Power

Abertillery.—LOAN.—In connection with the Urban District Council's application for permission to borrow £31,000 for an electricity scheme, the Electricity Commissioners have intimated that they are prepared to consider a modified application.

Australia.—NEW PLANT.—The Kalgoorlie Electric Power and Lighting Corporation has decided to install an additional 5,000-kW generating set.

Aylesbury.—IMPROVED LIGHTING.—The Electricity Committee has decided to prepare a scheme of improved lighting for the 1935-36 season.

Bolton.—INSPECTION.—The Back-o'-th'-Bank electricity station, where extensions have been made at an estimated cost of £90,860, was inspected by members of the Town Council on September 12th. During the inspection it was emphasised that new showrooms were urgently needed.

Boston.—WATER PUMPING.—The water engineer estimates that the use of electrical plant (instead of Diesel oil engines as originally intended) for pumping water at Fordington will effect a saving of about £220 per annum for five years.

Bradford.—PROPOSED SCHEMES.—The Electricity Committee proposes to install h.v. feeders for the purpose of meeting the increased load in the Great Horton district; to erect and equip a transformer chamber on land belonging to the English Electric Co., Ltd., to meet the increased load at the Phœnix Works of the company and on the district network; and also to replace obsolete h.v. switchgear with units of a higher rupturing capacity. The total estimated cost is £10,459.

Brighton.—PROGRESS.—During 1933-34 4,365 new consumers were connected, the total at the end of the period being 35,886.

Burton-upon-Trent.—PROJECTED EXPENDITURE.—The Electricity Committee has obtained sanction to borrow £22,000 for mains and services and £8,000 for plant.

EXTENSION.—A supply is to be provided to Kings Standing (£710).

Carlisle.—HEATING AND COOKING.—In every year since 1911-12 the load under this heading has advanced, according to statistics of the Electricity Department. In 1911-12 the figure was 18 kW, compared with 7,441 kW in 1933-34.

EXTENSIONS.—The Electricity Committee is to extend mains in Tyne Street, London Road, Upperby Road, Scalegate Road and at Crosby-on-Eden (£967).

Cheddar.—CAVE LIGHTING.—The possibilities of floodlighting as a means of attracting the public to natural beauty spots are illustrated in a novel manner in the Cheddar caves. At the instigation of Lord Weymouth, the owner of the Gough's caves, experiments were carried out with a wide range of G.E.C. floodlights equipped with "Osram" lamps. No fewer than seven different types of reflectors were eventually used to overcome the different lighting problems, one being specially designed and manufactured to suit the conditions. It was found that the rock colours responded better to partially corrected light than to illumination from ordinary incandescent lamps, and the floodlights were fitted with special colour-corrected glass reflectors. The result is one of the most beautiful and original floodlighting installations yet produced in this country. The installation work was carried out under the supervision of Mr. Waldo Maitland by Messrs. Marryat & Place, Ltd.

An illuminated cave at Cheddar

Derby.—DOMESTIC TARIFF.—Modifications made by the Electricity Department in the domestic tariff resulted in a remarkable development in this type of business during 1933-34. At March 31st last cooking apparatus connected amounted to 15,368 kW, an increase of 5,438 kW, and water-heating apparatus to 1,184 kW, an advance of 625 kW.

Douglas (I.O.M.).—PREMISES ACQUIRED.—The Electricity Committee has acquired premises at Queen Street (£2,625).

Dover.—TERMINATION OF AGREEMENT.—The Electricity Commissioners have agreed to the Corporation terminating its agreement with the Folkestone & District Electricity Supply Co., Ltd., for a supply of electricity. The agreement will expire next July.

OPTIONAL POWER TARIFF.—An optional scale of charges for power is to be introduced under which the rate will be assessed on the maximum demand instead of the installed capacity.

Edinburgh.—UP-TO-DATE TRAMCARS.—The Corporation has purchased a number of new tramcars which are electrically heated and are fitted with special fog lights. The Metropolitan-Vickers Electrical Co., Ltd., secured the contract for six and the English Electric Co., Ltd., for three. The detailed body-work was designed by Hurst, Nelson & Co., Ltd.

Exeter.—A POPULAR TARIFF.—Consumption of electricity under the "all-in" tariff of the Electricity Department increased by over 810,000 kWh to 3,500,000 kWh in 1933-34, which was the largest increase in any class of supply. The average use per consumer under this tariff was 1,300 kWh for the year.

Glasgow.—EXTENSIONS.—The Electricity Committee is to undertake extensions, for change-over purposes, at Mount Florida, Hill Street, and Maryhill Road (£2,358).

Great Yarmouth.—RURAL AREAS.—During 1933-34 the electricity sold by the Electricity Department in the rural areas amounted to 2,938,370 kWh, compared with 1,049,385 kWh in the preceding year, equivalent to an increase of 180 per cent.

Grimsby.—FIVE YEARS' PROGRESS.—The following figures for 1928-29 and 1933-34 illustrate the remarkable progress made by the Electricity Department: Consumers, 7,656 and 17,580; kWh sold, 15,857,764 and 33,401,818; length of cables laid, 202 and 418 miles; working costs, 0.754d. and 0.550d. per kWh; capacity of plant, 7,720 kW and 25,500 kW.

Harrow-on-the-Hill.—CHANGE-OVER.—The Electricity Commissioners have sanctioned the change-over from d.c. to a.c. which is shortly to be undertaken by the Harrow Electric Light & Power Co., Ltd.

Hastings.—EXPANSION.—Mr. A. J. Ryan, borough electrical engineer, states in his 1933-34 report that cooking and water heating by electricity expanded during the year. There was a net increase of 412 in the cookers on hire and ninety-five additional water heaters, the totals on hire at the end of the year being 874 and 289 respectively. The average price obtained for supplies of all kinds (1.27d. per kWh) was lower than ever before.

Horsted Keynes.—STREET LIGHTING.—The Parish Council is to consider a proposal of the local supply company for electric street lighting.

Ilkley.—PICTURESQUE LIGHTING.—The annual illuminations, which commenced on September 15th and continue for a month, include "fairy" light decorations in several streets and colour floodlighting of the principal buildings and gardens, the work being carried out by the Electricity Department in conjunction with local contractors. The Lighting Service Bureau of the E.L.M.A. arranged a series of public lectures and exhibits at the Winter Gardens.

Ipswich.—MENTAL HOSPITAL HEATING.—The Visiting Committee has had under consideration the question of improving the heating of the hospital wards, dormitories and day corridors, and recommends that the "Ray-rad" system shall be installed (£1,500).

SOURCES OF REVENUE.—The sources of revenue of the Electric Supply Department which showed the greatest improvement during 1933-34 were the combined tariff (23.5 per cent.) and power (21.9 per cent.).

SUB-STATIONS.—The Electricity Committee is seeking sanction to borrow £5,000 for the provision and equipment of sub-stations.

Kent.—OVERHEAD CABLES.—The South-East Kent Power Co. is to erect overhead cables from Broad Oak, near Canterbury, to Sturry and Bekesbourne, and thence to Bridge.

Kingston-upon-Hull.—ASSISTED-WIRING SCHEME.—During 1933-34 2,468 consumers were connected by the Electricity Department under this scheme, bringing the total to 16,990. Revenue derived from such consumers amounted to £42,598.

Largs.—ILLUMINATIONS.—The annual municipal illuminations were inaugurated on September 14th. Recently the burgh auditor stated that, in his opinion, the expenditure on the illuminations was not authorised by any of the statutes administered by the Town Council. The Council is waiting to hear the views of the Secretary for Scotland on the matter.

Leeds.—NOVEL LIGHTING.—Boats on the Waterloo Lake in Roundhay Park are utilised for the purpose of carrying floodlighting apparatus in a scheme which was inaugurated on September 15th, and is being continued for a fortnight. The lights, totalling about 3,000,000 c.p., are directed on the trees in the well-wooded park, and the combination of the white, red and other coloured beams gives a flame effect. The Tramways Department is carrying out the display, in co-operation with the chief officer of the parks.

Lichfield.—REDUCED CHARGES.—The City Council has made the following reductions in charges: Flat rate in the city, from 6d. to 5½d. per kWh; domestic rate for the whole area, "unit" charge from 1d. to ¾d. (first 1,000 kWh per quarter) and ½d. (beyond).

EXTENSIONS.—Overhead mains are to be erected at Shen-

stone, Curborough and Elmhurst, and loans of £2,420 for mains extensions have been sanctioned.

London.—LEWISHAM.—Following a petition from the majority of the tenants on the Lewisham Park estate for electricity to be installed in their houses, the Housing Committee communicated with the Ministry of Health. A letter has now been received from the Department stating that, subject to certain conditions, it would raise no objection to the cost of installing a supply in the seventy-two houses being charged to the assisted scheme revenue account. One of the conditions is that an additional amenity rent of 4d. per house per week be credited to the account. (The tenants have agreed to this.)

HACKNEY.—The number of kWh sold by the Electricity Department per head of the population in 1933-34 was 210, compared with 186 in the previous year.

Looe (Cornwall).—LIGHTING.—The Urban District Council has decided that the lighting of the town should be by electricity instead of by gas.

Luton.—DEVELOPMENT.—The Electricity Department connected 3,208 additional consumers during 1933-34, bringing the total to 19,465.

Milton Regis.—SUPPLY EXTENSIONS.—The Kent Electric Power Co., Ltd., has informed the Rural District Council of its intention to extend its supplies by the erection of overhead lines at Bapchild, Bredgar, and Tunstall.

Newmarket.—A SUPPLY FOR CHEVELEY.—The Rural District Council has been informed by the Beds, Cambs & Hunts Electricity Co. that it is reconsidering the question of supplying electricity to Cheveley and is attempting to obtain the necessary wayleaves. The company also proposes to lay underground cables at Snailwell.

Newport (Mon.).—ADDITIONAL PLANT.—The Town Council is to extend the plant at the East generating station by the installation of two boiler units and evaporator, de-aerator, screening and coal handling plant (£98,700).

New Zealand.—THE WAITAKI PROJECT.—The Waitaki hydro-electric plant in the South Island is now nearly completed, after six years' work, according to the *Times Trade and Engineering Supplement*. The plant, which is estimated to cost about £6,000,000, is linked up with that at Glenavy, which utilises Lake Coleridge. Ultimately, there will be five turbines, each of 23,000 h.p. The dam across the River Waitaki is of the curved spillway type and, with abutments, is 1,880 ft. in length, the maximum height being 120 ft. Owing to the fact that the flow of the river has often reached a million gallons per second, the spillway is of special design and strength.

Orpington.—INQUIRY.—A Ministry of Transport inquiry was held on September 11th into the application of the West Kent Electric Co., Ltd., for permission to erect overhead lines at Pratt's Bottom. The scheme was opposed by the Urban District Council.

Seale (Surrey).—OVERHEAD-LINE INQUIRY.—The application of the Mid-Southern District Utility Co. for permission to erect overhead lines in the parishes of Seale and Compton was opposed by the Surrey County Council and Guildford Rural District Council at a recent Ministry of Transport inquiry.

During this month extensive floodlighting programmes are being carried out at holiday resorts and spas. Our illustration shows the effective treatment of Pulteney bridge and the weirs, Bath

South Shields.—FREQUENCY.—The North-Eastern Electric Supply Co. is to change the frequency of supplies to the Harton area in connection with their standardisation programme.

Sutton Coldfield.—EXCELLENT PROGRESS.—Mr. T. Bloore, borough electrical engineer, states that excellent progress was made in every department of the undertaking during 1933-34.

Tamworth.—APPLICATION FOR SPECIAL ORDER.—The Tamworth District Electric Supply Co., Ltd., is applying for a Special Order to extend its area of supply by the inclusion of the borough of Tamworth and to enable it to acquire the Tamworth Corporation's undertaking. Objections respecting the application should be sent to the Secretary, Electricity Commission, Savoy Court, Strand, W.C.2, by October 9th.

London Trolley-bus Tests

IN order to ascertain the most suitable type of trolley-bus to operate over the routes which it is proposed to convert from tramway working in the near future, the London Passenger Transport Board recently placed in service two experimental vehicles. These are now running on the Wimbledon-Hampton Court route. One has an A.E.C. six-wheeled chassis (overall length 29ft. 11in.), a 73-seater Metro-Cammell-Weymann body and Metro-Vickers' electrical equipment, while the other has

One of the new trolley-buses

an A.E.C. four-wheeled chassis (overall length 25ft. 11in.), an English Electric 60-seater body and electrical equipment by the same company.

The vehicles are driven by self-ventilated compound motors, each of which has a special winding to give improved motor characteristics with regenerative control. The main circuit contactors are of the electro-magnetic type fitted with magnetic blow-out and renewable arc shutes, and apart from the interlocks they are completely interchangeable. The operating coils are energised from the trolley supply. The hand-operated reverser is in the form of a three-position drum switch which is mechanically interlocked with the accelerating controller.

On the 73-seater a scissors-type controller is used, and on the 60-seater the mechanism is of the drum type. In each case the controller is arranged to energise and de-energise the main and shunt contactor coils in correct sequence for acceleration when the pedal is depressed, and for retardation by regeneration on the first part of its return. Further retardation is effected by rheostatic braking on the latter part of the return stroke. Compressed air brakes are also fitted.

The special motor characteristics ensure automatic electric braking, with an even deceleration of not more than 4.5ft. per sec. per sec. irrespective of the manner in which the control is operated by the driver. Automatic regeneration is provided down to speeds of 10-12 m.p.h., followed by smooth rheostatic braking at speeds below this figure. In the event of the voltage exceeding 630 (as may occur if there is no load to absorb the regenerated current) an over-voltage relay operates, energising the braking contactor and opening the line contactors. In the eventuality of an over-voltage being created by another unit in the same section the motor generator is disconnected from the line.

Safety measures include mounting of all electrical units directly on to the chassis, secondary insulation being provided, and an automatic buzzer mounted in the driver's cab which gives instant warning should the brake pressure fall below a safe figure. A special A.E.C. testing plug is provided for testing all units in accordance with the M.O.T. regulations. A motor generator set of new design provides low voltage lighting, and radio interference suppression coils are connected in the trolley circuit.

In the larger vehicle the gantry for supporting the trolleys is constructed of pressed steel sections securely framed together and mounted to the upper deck cantrail structure. Rubber cushions are used to mount the trolley base, which is thus insulated from the body. This form of mounting also prevents trolley noises from being transmitted to the interior. In the second case the trolley base support is carried clear of the upper saloon roof on pressed steel brackets, securely bolted to and insulated from the pillar head brackets. The cross-bars are of nickel steel, and the trolley bases are securely bolted to channel section steel longitudes.

Wallasey.—SALE OF APPLIANCES.—The Electricity Department sold 1,054 electrical appliances on hire-purchase terms during 1933-34, compared with 821 in the previous year.

Wellington (Somerset).—EXTENSIONS.—The Wellington District Electricity Co. proposes to extend l.p. mains at Perry Elm, Bagley Green, Nowers and Smocks.

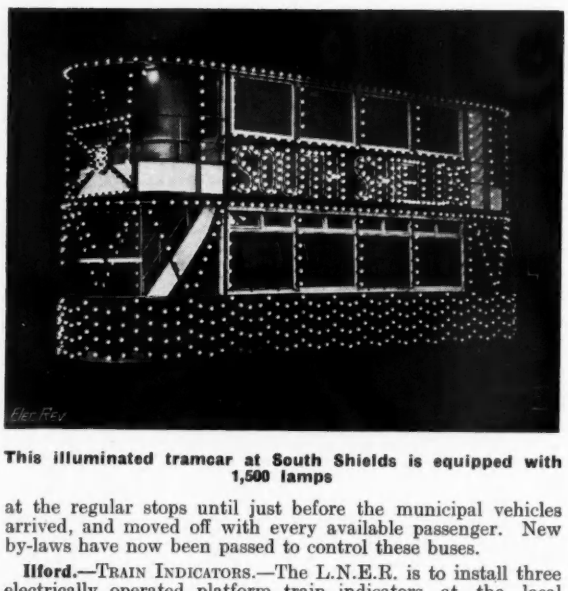
West Ham.—COOKING.—An intensive effort was made by the sales staff of the Electricity Department during 1933-34 to popularise electric cookers. As a result, 1,780 cookers were installed during the year, bringing the total to 2.616. At the end of the year cookers were being installed at the rate of nearly 300 a month.

Traction

Aberdeen.—ANNUAL REPORT.—In his report for the year ended May 31st last Mr. Alfred Smith reveals that the tramway revenue rose by £3,201, compared with the preceding year, to £151,613, while expenses fell by £2,936 to £112,795. The net profit was £8,607. On the omnibuses there was a surplus of £1,108. More than 1¼ million additional passengers were carried largely by the tramcars.

Calais.—CABLE GUIDE FOR SHIPS.—According to the *Telegraph*, a magnetic cable has been installed at Calais harbour by means of which, during fog, ships will be guided into the port without risk of accident.

George Town (Penang).—UNFAIR COMPETITION.—Revenue from the municipal trams and trolley-buses fell by $20,478 in 1933, compared with 1932, and the loss of $4,594 carried forward from the latter year was increased to $17,085. The engineer and manager states, in his annual report, that hired buses, which were not obliged to run to schedule, waited



This illuminated tramcar at South Shields is equipped with 1,500 lamps

at the regular stops until just before the municipal vehicles arrived, and moved off with every available passenger. New by-laws have now been passed to control these buses.

Ilford.—TRAIN INDICATORS.—The L.N.E.R. is to install three electrically operated platform train indicators at the local station.

Italy.—NEW POWER STATION.—For the supply of power to the railways now being electrified in the neighbourhood of Tarvisio and Trieste the Italian State Railways are constructing a power station at Udine. In the 1934-35 budget the sum of 2,000,000 lire is allotted for this work.

London.—TRAMWAY ACCIDENT.—When a stationary tramcar was hit in the rear by another tram at Tottenham last week a passenger on the former vehicle was killed. At the inquest an inspector of the Public Carriage Office stated that the magnetic brake of the second tramcar functioned normally when tested after the accident, but later when it was given an electrical test one of the contacts only acted intermittently. It might work 999 times out of 1,000, and was not a fault which could be easily discovered. A verdict of "Accidental death" was recorded.

Newport (Mon).—TRAMWAY FINANCES.—There was a total income of £50,447 from the Corporation tramways in 1933-34, compared with £51,288 in the previous year. Working expenses amounted to £45,777 (£44,733), and gross profit to £4,670 (£6,555). After deducting £15,182 (£17,794) interest charges, &c., there was a net loss of £10,512 (£11,239). Passengers carried numbered 7,257,149 (7,776,044). The omnibuses carried 8,034,520 (8,388,984) passengers, and the year's working resulted in a net loss of £8,713 (£7,944). Mr. N. J. Young, M.B.E., is general manager, and Mr. A. N. Moore, M.I.E.E., borough electrical and tramways engineer.

Oldham.—TRAMWAY SURPLUS.—Mr. J. F. Richards, general manager and engineer of the Passenger Transport Department, in his annual report for 1933-34, reveals that the Department made a net profit of £20,491, including £8,036 from the tramways; the corresponding figures in the preceding year were £18,536 and £8,586. The total revenue from tramways was £153,882 (£157,766), and working expenses, including power, £129,495 (£131,105). Rent on leased lines, interest charges, &c., amounted to £17,358 (£19,469). Passengers carried numbered 26,383,608 (26,639,825). The general manager and engineer is Mr. J. F. Richards.

Paris.—LOCOMOTIVE SPEEDS.—The Chemins de Fer d'Orleans recently carried out tests with electric locomotives on the line between Juvisy and Les Aubrais, when speeds of 125 km. per hour (about 78 m.p.h.), with momentary speeds of 150 km. per hour (about 94 m.p.h.) were attained.

South Africa.—JOHANNESBURG.—A number of the recommendations of the Spencer Transport Commission have been recommended for adoption by the Tramways and Light Committee. These include the purchase of fifty new tramcars and the separation of the tramway workshops from the Electricity Department.

Spain.—ELECTRIFICATION PROGRAMME.—The electrification programme now sanctioned by the Spanish Ministry of Public Works covers 960 miles, divided up as follows: Northern Railway, 297 miles (including Madrid-Avila main line); Madrid-Zaragossa-Alicante Railway, 395 miles; Andalusian Railway, 149 miles; State Railways, 70 miles; Bilbao-Portugalete Railway, 8 miles; and Vittoria-Mecolalde Railway, 42 miles. The State Decrees require all these lines to be on the 1,500-V d.c. system.

Sunderland.—PROFIT FROM TRAMWAYS.—Compared with an adverse balance of £8,420 on the working of the Corporation motor buses in 1933-34, the tramways showed a profit of £34,583 (£24,343 in the preceding year). The total revenue from the tramways was £126,582, an increase of £11,425, and working expenses were £82,930 (£81,818). Interest charges amounted to £3,789 (£3,645) and repayment of capital £5,280 (£5,351). Passengers carried numbered 29,770,000 (27,166,000), and by the motor buses 4,239,000 (6,974,000). The general manager and engineer is Mr. C. A. Hopkins, M.Inst.T.

TRAMWAY EXTENSIONS.—A £123,000 scheme for extending the tramways routes is under consideration. Recently the plan was included in the Committee's five-year plan, but was rejected by the Council.

U.S.S.R.—ELECTRIFICATION PROJECTS.—The U.S.S.R. Government has allotted a sum equivalent to £1,025,000 towards the electrification of the 315-mile line connecting Karaganda with Lake Balkhash. A further sum of £210,000 has been earmarked for the continuation of electrification on the Apatite-Khibin section of the Murmansk railway.

Communications

Australia.—SUGGESTED NEW HEADQUARTERS.—The Markets Committee of the Melbourne City Council proposes to erect a new building, at a cost of £30,000, which would be leased by the Australian Broadcasting Commission for use as its headquarters.

Great Britain.—WIRELESS LICENCES.—Approximately 260,300 wireless licences were issued during August, representing a net increase of 35,180. The total number of licences in force at the end of the month was 6,428,960, compared with 5,654,400 a year before. There were 270 successful wireless prosecutions during the month.

MORSE DISPLACED.—Last week the morse system was completely dispensed with at the Central Telegraph Office, London, for the purpose of sending out telegrams. In future, teleprinters will do the work. It is estimated that, whereas a morse operator could cope with up to fifty telegrams per hour, with the teleprinter this number can be doubled.

Greece.—RADIO.—It is stated in *World-Radio* that plans have been approved by the Technico-Financial Committee of the Ministry of Roads and Communications for the provision of a 20-kW broadcasting station of modern design at Athens.

Hungary.—INTERRUPTED BROADCASTING.—A report issued by the Postmaster-General (according to *World-Radio*) states that the 120-kW transmitter of Budapest No. 1 was interrupted on 110 occasions during its first eight months' working, equivalent to a period of 5 hours and 43 minutes, or 0.17 per cent. of the total working time. In the first eight months' working of the earlier (20 kW) transmitter the percentage of the emergency pauses stood at 0.54. A detailed analysis of the causes of these technical disturbances shows they are attributed to four factors, namely, microphones, portable amplifiers, transmitting wires, and the transmitter proper.

Irish Free State.—REVENUE FROM WIRELESS.—The accounts for the year ended March 31st last show that the revenue derived from the sale of wireless receiving licences amounted to £26,497, and from the sponsored programmes £22,816. There was a balance of £1,736 out of the amount voted for broadcasting.

South Africa.—RADIO SETS IN CARS.—New regulations have been issued by the South African Government regarding the use of wireless receiving sets in private motor cars. Visitors to the Union may obtain a permit to use wireless apparatus in their cars for a period not exceeding three months.

U.S.S.R.—A NEW DEVICE.—An invention which, it is claimed, will enable ships to reduce the number of their wireless operators has been successfully tested at the Institute of Water Transport, Leningrad. It consists of an automatic apparatus for receiving distress signals.—*Reuter.*

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—State Electricity Commission. October 29th. Twelve automatic induction voltage regulators of various ratings. (A.Y. 12611.)*
November 29th. Metropolitan Tramways Board. P.i. l.c. cable. (A.Y. 12629.)* Traction sub-station units. (A.Y. 12623.)*
Posts and Telegraphs Department. October 30th. Submarine cable of various types. (A.Y. 12620.)*
SYDNEY.—December 3rd. New South Wales Public Works Department. Hydro-electric plant in connection with the Burrinjuck water power development scheme. (A.Y. 12617.)*

Beckenham.—September 24th. U.D.C. House service meters. (September 7th.)

Bentley.—September 28th. County Council. Installation of electric lighting at High Street Council school. Particulars of Education Officer, County Hall, Wakefield; tenders to Sir C. McGrath, clerk to County Council, Wakefield.

Birmingham.—October 2nd. Electric Supply Department. H.p. and p.i. cables during a period of twelve months ending October 31st, 1935. (September 7th.)
October 4th. Meters as required from November 1st to April 30th next. (See this issue.)

Bridgend.—October 9th. U.D.C. H.p. overhead line, transformer kiosk and change-over switch kiosk. (See this issue.)

Carlisle.—City Council. Installation of electric lighting in eighty houses on the Currock House Estate and twenty-eight on the Raven Nook Estate. Plans by P. Dalton, city engineer, 18, Fisher Street.
September 29th. Electricity Department. Meters for the ensuing year. (September 14th.)

Chichester.—October 8th. City Council. Cables, switchgear, kiosks, outdoor sub-stations, &c., for the development of the south-western portion of the Council's area. (September 14th.)

Conway.—Electricity Department. Directional street lighting fittings. (See this issue.)

Cromarty.—September 22nd. Town Council. Electric street-lighting works. Specifications from Town Clerk.

Doncaster.—October 13th. Rural District Council. Electric wiring of offices. Specifications from the Consulting Engineer, 21, Temple, Dale Street, Liverpool; tenders to R. Bowers, clerk, Nether Hall.

Douglas (I. of M.).—October 17th. Electricity Department. One 3,750-kW turbo-alternator and one 40,000-lb. water-tube boiler. (September 14th.)

Ealing.—September 24th. Electricity Department. Cables, including laying and jointing. (September 14th.)

Ecuador.—QUITO.—November 13th. Municipality. Electric power plant (3,000 h.p.), street-lighting equipment, &c. (A.Y. 12589.)*

Egypt.—CAIRO.—October 18th. Ministry of Public Works. Evacuating and dewatering pumps with electric motors, switchgear, main electric motors, accessories, switchgear and accessories, main and auxiliary transformers and accessories, oil for transformers and circuit-breakers, station electric lighting and equipment, and filter plant and accessories. (G.Y. 14151.)*
November 3rd. Electrical material in connection with the installation of overhead and underground networks at Barrages. (A.Y. 12591.)*
November 15th. Mechanical and Electrical Department, Ministry of Public Works. Power house equipment at Gordon's Tree Dockyard. (G.Y. 14291.)*

Ministry of the Interior. November 17th. Material in connection with the overhead and underground networks at Chebin-el-Kanater. (A.Y. 12626.)*
November 10th. Material for the renewal and extension of the distribution system at Manfalout. (A.Y. 12636.)*

GIZA.—December 8th. Ministry of Public Instruction. Apparatus for the electrical laboratory of the Royal School of Engineering. A.Y. 12577.)*

KHARTOUM.—November 20th. Sudan Irrigation Department. Power house equipment. (A.Y. 12631.)*

Gellygaer.—October 8th. U.D.C. L.p. and e.h.p. overhead line requirements, domestic apparatus, cookers, water heaters and consumers' meters. (See this issue.)

Gloucester.—Electricity Department. Electric meters and p.i. cables. (See this issue.)

Greece.—October 17th. Hellenic Electric Railway Co. Eleven electric coaches for the Piraeus-Perama line. (G.Y. 14239.)*

Hastings.—September 28th. Corporation. Converting to electric drive the time and striking mechanism of the clock in the Albert Memorial. (September 7th.)

Haverfordwest.—October 1st. Corporation. Three electrically operated water-pressure boosting pumps. Specifications from Water Engineer, Council Chamber.

Hull.—September 24th. Education Committee. Electrical installation at Ainthorpe Grove schools. Particulars from City Architect, Guildhall (deposit £1 1s.).

India.—SIMLA.—October 10th. Stores Department. Electricity meters for one year. (A.Y. 12618.)*

DELHI.—October 30th. Stores Department. Grid sub-station and local distribution sub-station, switchgear. (A.Y. 12637.)*

London.—GREAT WESTERN RAILWAY.—September 27th. Telegraph instruments, electrical apparatus, &c. (September 14th.)
S.E.1.—September 21st. India Stores Department. 11,000-V and 460-V cable and cable boxes. Specifications from Director-General, Belvedere Road (deposit 5s.).

Manchester.—October 4th. Corporation. Heating installation at Crowcroft Park school, Longsight. Specifications from Surveyor, Education Offices, Deansgate.

New Zealand.—WELLINGTON.—November 1st. Post and Telegraph Department. Dynamo sets. (A.Y. 12592.)*

Rosslynlee.—September 29th. Midlothian and Peebles District Asylum. Various supplies, including electrical fittings, for six months. Forms from C. L. Addison-Smith, clerk and treasurer, 19, Heriot Row, Edinburgh.

Salford.—October 3rd. Electricity Department. 6,600/400-V 3-phase oil immersed power transformers. (See this issue.)

Shipley.—October 17th. Electricity Department. 11,000-V cable. (See this issue.)

Southend-on-Sea.—September 30th. Corporation. X-ray equipment for hospital. Specifications from Medical Officer of Health, Public Health Offices.

Southampton.—September 22nd. Electricity Department. Electric lighting, power and heating installations at Merry Oak Elementary school. Specifications from W. G. Turner, Civic Centre (deposit £1 1s., payable to Borough Treasurer); tenders to F. L. Freeman, secretary to the Education Committee, Civic Centre.

Stahley (Co. DURHAM).—October 4th. Electricity Department. Meters, lamps, cables and wiring supplies for twelve months. (See this issue.)

Tasmania.—HOBART.—October 22nd. Hydro-electric Commission. Four transformers for the Rosebery sub-station. (A.Y. 12584.)*

Uruguay.—MONTEVIDEO.—State Electricity Supply and Telephone Administration. October 29th. L.c. v.i.r. cables of various types. (A.Y. 12601.)*
October 31st. Knife, rotary and pear-shaped switches. (A.Y. 12600.)*

Walthamstow.—September 28th. Electricity Department. E.h.p. and l.p. a.c. switchgear. (September 7th.)

Walton & Weybridge.—October 5th. Electricity Department. L.p. cables for period ending June 30th, 1935, and laying only of such cables. (See this issue.)

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* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Aldershot.—Town Council. Accepted. Electrical work in connection with the change-over (£1,713).—Burch & Vertue.

Bedlington.—Urban District Council. Accepted. Electric street lighting at Guide Post, North Blyth and Moorhouse.—Sleigh & Wood.

Douglas (I. of M.).—Finance Committee. Accepted. Wiring dwellings in King Street and James Street (£507).—W. Mullin, Ltd.

Glasgow.—Housing Committee. Accepted. Electrical installation at housing schemes: Old Shettleston Road (£272) and Teucharhill (£1,129).—J. Stuart Denholm.
Education Committee. Accepted. Electrical work at East Keppoch temporary school (£231).—R. J. McIntyre.

Grimsby.—Electricity and Public Lighting Committee. Accepted. Cable in connection with distribution extensions (£1,902).—Johnson & Phillips, Ltd.

Hastings.—Electricity Committee. Recommended. Meter testing equipment (£564).—H. J. Fuller & Sons.

London.—SHOREDITCH.—Electricity Committee. Recommended. Cables (£953).—W. T. Glover & Co., Ltd.
LEWISHAM.—Baths Committee. Recommended. Wiring at Forest Hill and Ladywell baths.—E. Dyne & Co., Ltd.
Housing Committee. Recommended. Electrical installations at flats at Eltham Road.—Kirkdale Electrical Co.

Middlesbrough.—Town Council. Accepted. Cables for twelve months.—British Insulated Cables, Ltd. Electric lighting at the Archibald and Linthorpe Council Schools.—Baker Bros.

Sandown.—Isle of Wight Education Committee. Accepted. Electric lighting at Secondary school.—C. Clark & Sons.

South Shields.—Electricity Committee. Accepted. One 600-kVA group of Scott-connected transformers (£846).—Ferranti, Ltd. The Committee states that twelve tenders were received, all of the same amount.

Swansea.—Electricity Committee. Accepted. For Tir John power station: Static transformer (£6,100).—Hackbridge Electric Construction Co., Ltd.; Batteries (£2,115).—British Thomson-Houston Co., Ltd. Retubing superheater at Strand power station (£127).—Unit Superheaters, Ltd. Switchgear.—Metropolitan Vickers Electrical Co., Ltd. (£495); New Switchgear Co., Ltd. (£198); General Electric Co., Ltd. (£73); W. Lucy & Co., Ltd. (£92).

Taunton.—Electricity Committee. Accepted. Wiring of small dwellings.—J. M. Glide. E.h.p. switchgear and accessories.—Metropolitan Vickers Electrical Co., Ltd.

Wallasey.—Electricity Committee. Accepted. E.h.p. switchgear (£599).—English Electric Co., Ltd. L.p. switchgear (£300).—Metropolitan Vickers Electrical Co., Ltd. Cable extensions (£844).—British Insulated Cables, Ltd.

Ware.—Urban District Council. Accepted. Electrically driven centrifugal deep well pump at the Upper Water Works (£505).—Harland Engineering Co.

Notes

The London Pavilion

The electrical installation of the London Pavilion which has been reopened as a cinema, is of considerable interest. The total connected load aggregates 250 kW and the supply is from five services brought in by the St. James & Pall Mall Electric Light Co., Ltd., at 400 V, 3-phase, for power, and the London Electric Supply Corporation, at 230 V, single-phase, for lighting. Over 20,000 ft. of conduit and 35,000 yds. of cable have been used for the general installation work. Control boards are installed, serving stage lighting, general lighting, auditorium lighting, two 25-kW M.G.'s for projector, one 5-kW M.G. for secondary lighting, ventilating plant and vacuum cleaning, plant motors totalling 27½ h.p., and neon lighting. An interesting feature is the twelve colour changing spot units housed in the circle fronts, which are used for illuminating the proscenium arch and tableau curtain and also for single spotting of artists. The operation of these is automatic, and electrically controlled from the stage and projection room. They were manufactured by the Major Equipment Co., Ltd. Another useful addition is the illumination of three colour dip boxes, the opening of the lid switches on a light, internally illuminating the box. It will be noticed from the illustrations on page 378 that there are no fittings whatsoever in the auditorium, all lighting, primary and secondary, being from concealed units. The principal medium of illumination employed for the decorative lighting in other parts of the theatre are "Tubelamps," manufactured by Tubelight Sales, Ltd. These are installed in the cornices of the entrance vestibule, lobbies, on the staircases, and the balcony bars. The safety lighting is dependent on a storage battery supplied by the D.P. Battery Co., Ltd. This consists of forty-eight cells 150-Ah capacity, sealed-in type and fitted with the heavy type Planté positives and sponge negatives.

The consulting engineers were Messrs. E. Wingfield-Bowles & Partners, and the electrical contractors, the Berkeley Electrical Engineering Co., Ltd.

The B.I. Copper Refinery

What we believe to be the first works visit by air in this country was made on Tuesday to the copper refinery of British Insulated Cables, Ltd., at Prescot, Lancs, which was described in our issue of June 9th, 1933. The party which assembled at Croydon Aerodrome (several of whom appear in a group photograph on page 389) included the following: Sir John Brooke (vice-chairman, Electricity Commission), Capt. J. M. Donaldson (chief engineer, Northmet Co.), Messrs. S. B. Donkin (Messrs. Kennedy & Donkin), A. W. Goldsack (Messrs. Rendell, Palmer & Tritton), F. Lydall (Messrs. Merz & Partners), H. J. Randall (City of London Electric Lighting Co., Ltd.), S. Salmon (Messrs. Alexander Gibb & Partners), W. L. Stampe (electrical engineer, United Provinces Government), H. G. Tisdall (of the Crown Agents for the Colonies), R. W. Weightman (Messrs. Preece, Cardew & Rider), Johnstone Wright (chief engineer, C.E.B.). They were conveyed by the *City of Coventry*, one of the Argosy class of Imperial Airways, the journey taking 1 hr. 50 min. in weather that showed aerial travel at its best. The return was made the same evening, under equally favourable conditions. During the visit Mr. G. H. Nisbett (managing director, B.I. Co.) stated that his company had entered into a fifteen-year contract to take 470 tons per week of copper pig from the Roan Antelope mine, Rhodesia, which was, as far as was known, the only source in the world of blister pig of a purity of well over 99 per cent.; such impurities as there were were not of a kind to interfere with mechanical or electrical properties. The highest output from the fire refinery had been produced the previous week, viz., over 1,000 tons; more than 350 tons of this had been disposed of to others, and the demand from outside firms was steadily growing.

A picture taken from the Tower showing the striking effect of Blackpool's illuminations

Photo-electricity

In a paper read last week before Section A of the British Association Messrs. N. R. Campbell and C. C. Paterson pointed out that a scientific discovery might do more harm than good if the community was unprepared for it or it might be useless. Thus the photo-electric cell had been known for sixty years, but it was only within the past eight years with the advent of the talking film that there had been any appreciable demand for it; the emission type had advantages over conductive cell for this purpose. The obstacle to their extended use was not technical but simply the ignorance of those who might use them. When photo-electric became the concern of the large electrical firms they were brought to the notice of all electricians. The authors regarded their chief field for development as measuring instruments, such as greyhound timing and testing excessive speed of motorists, but they preferred a time switch for the control of public lighting. Other uses were for smoke detection, speeding up an escalator when a passenger steps on it, detecting pin holes in metal sheet for motor car radiators, stopping paper-making machinery when the paper tears, counting objects passing down a conveyor, ensuring that every packet of cigarettes contains its card, preventing vehicles from attempting to pass under a bridge too low for them, and guiding cloth past a knife by which it is to be cut.

Educational

The 1934-35 Calendar of the Royal Technical College, Glasgow, is now available and contains full details of the day and evening classes in the various subjects covered by the College, including electrical engineering and allied subjects.

A course of lectures on television by Mr. J. J. Denton, hon. secretary of the Television Society, commences at the Borough Polytechnic, S.E., on October 4th. The syllabus can be obtained from the Principal.

Institution of Engineers and Shipbuilders in Scotland

The 1934-35 session of the Institution of Engineers and Shipbuilders in Scotland commences on October 4th when Prof. J. D. Cormack will deliver his presidential address. Meetings arranged during the session include the following:—November 6th: "Cinematograph Apparatus with Special Reference to Sound Projection," by D. W. Hamilton. February 12th: "Electric Arc Welding in General Engineering," by J. Orr. March 12th: "A Diesel Electric Paddle Ferry Boat," by M. E. Denny. The "James Watt" dinner will be held at the Grosvenor Restaurant, Glasgow, on October 12th.

Extensions at Brighton

In our account of the 30,000-kW extension at Southwick power station last week we referred to the new 6,000-kW Richardsons Westgarth turbine used to link up the 675-lb. per sq. in. steam range with the older system. The alternator driven by this turbine is an existing machine made by the Metropolitan-Vickers Electrical Co., Ltd. The set shown, in part, in the bottom right-hand corner of the illustration of the Parsons 30,000-kW set in the turbine room was a three-cylinder Richardsons Westgarth-Brown-Boveri turbine.

The Junior Institution of Engineers

The next session of the Junior Institution of Engineers commences on October 5th with an informal meeting and on October 12th Mr. E. King will deliver the chairman's address. Other meetings arranged for the first half of the session include the following:—November 2nd: Informal meeting. Talk on "Instrument Manufacture" by G. W. Watts. November 9th: Annual general meeting. November 16th: Informal meeting. "High Pressure Steam Boilers," by J. Calderwood. December 14th: Presidential address by Mr. C. C. Paterson. December 21st: Informal meeting. "Rules and Regulations connected with Neon Advertising Signs," by E. H. Whatton.

Lighting Droitwich Station

The lighting fittings in the machine and engine rooms at the new B.B.C. transmitting station at Droitwich were specially designed and manufactured by Frederick Thomas & Co., Ltd. They are attached to the ceilings, which are 24 ft. high, and glazed with the well-known "Efteelite" diffusing glass, each containing a 500 W gasfilled lamp. In the machine room the lighting load is 6 kW and the floor area 4,838 ft., or 1.24 W per sq. ft., giving an intensity of 6.4 foot-candles. In the engine room the load is 5 kW and the floor area 4,160 sq. ft., or 1.2 W per sq. ft., giving an intensity of 5.67 foot-candles. All the equipment is clearly defined, and there is a noticeable absence of harsh shadows and glare, either direct or reflected.

Messrs. Hopkinsons, Ltd., supplied a centrifugal oil purifier for this station.

Appointments Vacant

Assistant chief clerk for Guildford Corporation Electricity Department.

Sub-stations superintendent for Poplar Borough Council electricity undertaking.

(See our classified advertisements.)

Junior lady demonstrator for the Bedford Electricity Department.

Assistant, II, for the Royal Aircraft Establishment, South Farnborough (salary £310, rising to £381).

Makers' Names Wanted

H. W. M. & Co. (in a square) wattmeter.

REGAL vacuum cleaner.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. C. T. Astbury has resigned his position with Carron Company after six years' service. Mr. Astbury was previously Scottish manager of the Revo Electric Co. and burgh electrical engineer of Wishaw. He is now the proprietor of the Westfield Hotel, Saltcoats.

Mr. J. W. Ray, A.M.I.E.E., assistant postal engineer at Brighton, has retired after forty-five years' service, and has been presented by his colleagues with a portable typewriter.

Mr. F. W. Smith, who, as reported in our issue of August 17th, has resigned from Crompton Parkinson, Ltd., has now taken up a position on the board of Messrs. Burdette & Co., Ltd., electrical engineers and contractors, of 5-7, Pocock Street, S.E.1. Mr. Smith will be responsible for the installation and sales side of the business.

Mr. F. R. Yearsley, who has been on the staff of the Bradford Corporation Electricity Department for eleven years, is leaving to take up the post of sales representative for the Yorkshire area for British National Electrics, Ltd.

Mr. W. A. Royle, borough electrical engineer at Blackburn, has been appointed electrical engineer and manager of the Sunderland Corporation electricity undertaking at a salary of £1,250, rising by annual increments of £50 to £1,500 per annum. Mr. Royle was educated at Christ Church Higher Grade School and the Science and Art School, Southport, and at the Manchester College of Technology. He joined the Southport Electric Lighting Co. in 1905 as a pupil, and in 1908 was appointed assistant engineer with the Monmouth Corporation electricity undertaking, becoming chief assistant two years later. In 1911 he became chief assistant with the British Westinghouse Electric & Manufacturing Co., Ltd., and in the following year joined Messrs. Ferranti, Ltd., as chief erecting engineer, subsequently becoming works electrical engineer. He went to Sunderland as sub-station superintendent in 1918, where he became successively distribution engineer, technical assistant and sales manager, and assistant manager. He took up his appointment as borough electrical engineer and manager of the Blackburn electricity undertaking in December, 1929. He is an associate member of the Institution of Mechanical Engineers and an associate member of the Institution of Electrical Engineers.

[*Lafayette*
Mr. W. A. Royle

Mr. E. C. Donaldson Rawlins, C.M.G., was recently appointed Commercial Counsellor at Berlin in succession to the late Lt.-Col. J. W. F. Thelwall. His position as Commercial Counsellor at Vienna is being filled by the transfer from home of **Mr. R. M. A. E. Turner,** who is succeeded by **Mr. R. L. Nosworthy.**

Some of those who took part in the visit by air to the B.I. copper refinery (see page 388)
The group includes Messrs. H. J. Stone, F. Lydall, A. S. Macphail, R. W. Weightman, H. G. Tisdall and Johnstone Wright

Mr. A. W. Hirst, the author of the article on "Magnetising Current Waves" on page 368 of this issue, took his B.Sc. (Engineering) degree, with first-class honours in electrical engineering, at Bristol University in 1920. From 1920 to 1924 he was with the British Thomson-Houston Co., Ltd., as a student apprentice, and then became assistant designing engineer in that company's large d.c.-machine section. In 1926 he secured a research scholarship at Bristol University, graduating M.Sc. in 1928. From 1927 to 1932 he was lecturer in electrical engineering at the Technical College, Crewe, and in the following year took up his present position as chief lecturer in electrical engineering at the Leicester College of Technology. Mr. Hirst became an associate member of the Institution of Electrical Engineers in 1927, and he is the author of a book on "D.C.-Machine Design," published by Messrs. Blackie & Sons in 1931.

[*Elliott & Fry*
Mr. A. W. Hirst

Mr. S. P. Ford has resigned his position with Edison Swan Electric Co., Ltd., to take up the appointment of manager at Messrs. Cunningham, Ltd., to which firm he was originally apprenticed.

Mr. F. Purser-Fletcher, O.B.E., A.M.Inst.C.E., A.M.I.E.E., superintending electrical engineer of Devonport Dockyard, whose portrait accompanies this note, has been appointed Assistant Director of Electrical Engineering at the Admiralty.

[*Vandyk Studios*
Mr. F. Purser-Fletcher

We are glad to report that **Lord Hirst,** chairman of the General Electric Co., Ltd., who underwent a serious operation on Wednesday night last week, is making satisfactory progress. The hope that he may make a speedy and complete recovery is widespread throughout the industry.

Mr. C. H. Blackburn, of Messrs. C. H. Blackburn & Co., manufacturing electrical engineers and wholesalers, 2, Sandland Street, W.C.1, was recently adopted as prospective Liberal and Radical Candidate for the Parliamentary constituency of East Islington.

Mr. W. R. Elston and **Mr. H. Burkinshaw** have been elected directors of the Madras Electric Tramways (1904), Ltd. Mr. Burkinshaw has also joined the board of the Madras Electric Supply Corporation, Ltd.

Obituary

Mr. R. Birkett.—We regret to record the death at the age of sixty-seven years of Mr. Robert Birkett, M.I.E.E., who was for twenty-four years borough electrical engineer of Southend. The funeral took place yesterday, Thursday, at Slough, where he went to reside after his retirement, owing to ill-health, in September, 1929. Mr. Birkett was born in Lancashire; he was a Faraday House man and was subsequently with the firm of Ernest Scott & Mountain, at Newcastle. He held appointments at Chelsea and Burnley in connection with the electricity supply undertakings before going to Southend. During nearly the whole of his service as borough electrical engineer he was also general manager of the Southend tramways system. He leaves a widow, one son, and four daughters. At its meeting on Tuesday last the Council passed a resolution of sympathy with Mrs. Birkett.

Mr. J. Atkinson.—The death occurred on September 14th of Mr. John Atkinson, A.M.I.E.E., at his home, 20, Arundel Road, Lytham St. Annes, after a long illness. Mr. Atkinson

was on the staff of the Bolton Corporation Electricity Department for over twenty-five years until he relinquished his position owing to ill-health in 1930. He was well known as a teacher of evening classes to many students of the Bolton Technical College.

Mr. S. B. Tite, whose death has taken place at Coventry, where he was staying for health reasons, had for over twenty-five years been on the staff at the Canterbury Corporation electricity works.

Mr. S. Svenningson.—The death occurred recently, at the age of fifty-one, of Mr. Sven Svenningson, the chief engineer of the Shawinigan (Quebec) Water & Power Co. He was a Norwegian by birth, who went to the United States in 1909 and to Canada in 1913.

Mr. J. H. Clarkson.—The death is announced, in his sixty-ninth year, of Mr. John Henry Clarkson, one of the founders and an original director of the Barlborough Electric Light Co., Ltd.

Will.—Mr. H. R. Beeton, chairman of the Brompton & Kensington Electricity Supply Co., Ltd., left £143,957, with £133,994 net personalty.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Electric Power & Communications Trust, Ltd.—Private company. Registered September 12th. Nominal capital, £100,000 in £1 shares. Objects: To adopt an agreement with the Telephone & General Trust, Ltd., and British Insulated Cables, Ltd., for the acquisition of the assets referred to therein; to carry on the business of a financial and investment company in all its branches for the purpose and with the object amongst others of developing and assisting in the development and/or operation in India and elsewhere of power and/or lighting schemes, telephone and telegraph undertakings (including all forms of communications whether wired, wireless or otherwise), and engineering and electrical industries generally; and to carry on the business of financiers, bankers, capitalists, underwriters, dealers in land, business concessions, mines and stocks, merchants, traders, shipping agents or ship owners, concessionaires, contractors for public and other works, &c. The subscribers are: E. Rudland, 2, Bond Court, Walbrook, E.C.4, and F. Hopton, 2, Bond Court, Walbrook, E.C.4, clerk. Registered office: Donington House, Norfolk Street, Strand, W.C.2.

Linkboy Products, Ltd.—Private company. Registered September 12th. Capital, £200 in 2s. shares. Objects: To acquire patents, patent rights, *brevets d'invention*, licences, protections and concessions, and to carry on the business of manufacturers of, agents for and dealers in electrical apparatus, machinery, plant and appliances, &c. The directors are: C. H. F. Jefferies, 14, Manorgate Road, Kingston, Surrey, and three others. Secretary: Douglas S. Hatton.

J. Gauld & Co., Ltd.—Private company. Registered September 12th. Capital, £1,000 in £1 shares. Objects: To adopt an agreement with John A. Gauld, and to carry on the business of mechanical and electrical engineers, manufacturers of heating installations, oil fuel burners, &c. The permanent directors are: J. A. Gauld, "Reddrie," Salthill Drive, Slough, and two others. Registered office: Farnham Road, Trading Estate, Slough.

W. Rowberry & Son (Ross), Ltd.—Private company. Registered September 12th. Capital, £2,000 in £1 shares. Objects: To carry on the business of engineers, electrical fitters, contractors, furnishers, and relayers of and dealers in electrical and wireless appliances, &c. The directors are: E. J. Rowberry (manager), 14, Gloucester Road, Ross-on-Wye, and two others.

Grays Electrical Co., Ltd.—Private company. Registered September 12th. Capital, £1,000 in £1 shares. Objects: To acquire the business of electrical engineers, and contractors and dealers in musical instruments and wireless instruments, now carried on by W. E. Taylor and David C. Fender, at 63, Orsett Road, Grays, as The Grays Electrical Co., at 31, High Street, Grays, as the Electrical Fitting Co., and at Calcutta Road, Tilbury, as the Tilbury Electrical Co. The permanent managing directors are: W. E. Taylor and D. C. Fender, both of 63, Orsett Road, Grays. Registered office: 63, Orsett Road, Grays.

Insulations (London), Ltd.—Private company. Registered September 14th. Capital, £10,000 in £1 shares. Objects: To carry on the business of mechanical, electrical and general engineers, brass, iron and metal founders, &c. The subscribers are: E. Rudland, 2, Bond Court, Walbrook, E.C.4, and B. Griffin, 2, Bond Court, Walbrook, E.C.4. Registered office: Lincoln House, 296, High Holborn, W.C.1.

W. H. Bramall & Co., Ltd.—Private company. Registered September 14th. Capital, £4,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in pressure and vacuum gauges and recording instruments and fittings, electrical instruments, &c., and to adopt an agreement with Thos. E. King. The directors are: Ida F. Napier, Eller Howe, Barkers Lane, Ashton-on-Mersey, Ches, and T. E. King, 12, Whitefield Road, Ashton-on-Mersey. Registered office: Napier Works, Wright Street, Cornbrook, Manchester.

Southport Northern Wireless Supplies, Ltd.—Private company. Registered September 13th. Capital, £1,000 in 50 7½ per cent. cumulative preference shares of £10 each and 2,000 ordinary shares of 5s. each. Objects: To carry on the business of manufacturers of, agents for and dealers in wireless apparatus, electrical fittings, appliances, apparatus and accessories, gramophones and records, &c. The first directors are: W. Hindle, 81, Avondale Road, Southport, and J. Smith, 148, Scarisbrick New Road, Southport.

Ordsall Supply Co., Ltd.—Private company. Registered September 15th. Capital, £750 in £1 shares. Objects: To carry on the business of wireless constructors, erectors, factors and dealers, electrical and wireless engineers, &c. The subscribers are: N. France, 62, Hulton Street, Salford, and four others. Secretary: G. H. Pole.

Greenwood, Dewar & Co., Ltd.—Private company. Registered in Edinburgh September 8th. Capital, £500 in £1 shares. Objects: To carry on the business of electrical engineers, machine and tool makers, pattern makers, &c. The directors are: F. Greenwood, 25, Mount Stuart Street, Glasgow, S.1, and J. M. Buchanan, Wedderlea Drive, Glasgow, S.W.2. Registered office: 192, St. Vincent Street, Glasgow, C.2.

York Autoelectrics, Ltd.—Private company. Registered September 13th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical, mechanical, radio, motor and general engineers and contractors, manufacturers, wholesalers and retailers of and dealers in electrical apparatus and instruments, wireless telegraphy and apparatus used in connection therewith, &c. The subscribers are: C. T. Marks, 31, St. Marys, Bootham, York, and A. I. C. Forster, 32, Parliament Street, York, accountant. C. T. Marks is the first director. Registered office: Old Corporation Bus Depot, Piccadilly, York.

Returns of Electrical Companies

Torquay Tramways Co., Ltd. (in liquidation).—Satisfaction (1) in full on December 31st, 1933, of trust deed dated December 8th, 1908, and registered December 18th, 1908, securing £60,000 5 per cent. debentures, and (2) to the extent of £32,700 (balance outstanding) on March 31st, 1934, of trust deed dated March 8th, 1911, and registered March 15th, 1911, securing £60,000 5 per cent. prior lien debentures. (Notices filed September 4th, 1934.)

Liverpool H.P. and Wholesale Co., Ltd.—Issue on September 1st, 1934, of £100 debentures, part of a series already registered.

Gramo-Radio, Ltd.—Memorandum of deposit dated August 25th, 1934, charged on freehold and leasehold land with property erected thereon known as Commercial Works, Church, and Phœnix Works, and all other buildings comprised in the lease of cinema hall, skating rink, &c., formerly known as Paradise Works at Church Street and Cannon Street, Accrington, to secure all moneys due or to become due from the company to the Union Bank of Manchester, Ltd.

Renlin, Moreton, Ltd.—Debenture dated August 18th, 1934, to secure £75 charged on the company's property, present and future, including uncalled capital. Holder: R. Strange, The Old Farm House, Anstye, Haywards Heath.

Wallace & Raffell, Ltd—Private company. Registered September 12th. Capital, £1,000 in £1 shares. Objects: To acquire the business of Wallace & Raffell, wholesale electrical and wireless dealers, carried on by Samuel W. Raffell at 133, Hereson Road, Ramsgate. The directors are: W. B. Raffell. 133, Hereson Road, Ramsgate, and two others. Registered office: 133, Hereson Road, Ramsgate.

J. Tee & Co., Ltd.—Capital, £500 in 10s. shares. Return dated April 10th, 1933 (filed August 28th, 1934). 603 shares taken up. £1 10s. paid. £300 considered as paid. Mortgages and charges, £1,000.

John Adams, Ltd.—Capital, £7,000 in 1,000 ordinary and 6,000 preference shares of £1. Return dated May 22nd, 1934. 300 ordinary and 2,700 preference shares taken up. £3,000 paid. Mortgages and charges, nil.

Liverpool Electric Cable Co., Ltd.—Capital, £300,000 in £1 shares. Return dated May 17th, 1934. 150,000 shares taken up. £127,833 paid. £22,167 considered as paid. Mortgages and charges, £15,097 17s. 4d.

Bournemouth and Poole Electricity Supply Co., Ltd.—Capital, £1,300,000 in 75,000 4½ per cent. cumulative preference, £175,000 6 per cent. cumulative preference, 150,000 new preference and 900,000 ordinary shares, all of £1 each. Return dated April 10th (filed July 30th), 1934. 75,000 4½ per cent. preference, 120,542 6 per cent. preference and 725,837 ordinary shares taken up. £550,000 paid. £431,379 considered as paid. Mortgages and charges, £187,500.

Richardsons, Westgarth & Co., Ltd.—Capital, £700,000 in 350,000 preference and 350,000 ordinary shares of £1. Return dated May 29th (filed July 14th), 1934. All shares taken up. £700,000 paid. Mortgages and charges, £25,605.

Calcutta Tramways Co., Ltd.—Capital, £1,400,000 in 950,000 ordinary and 450,000 preference shares of £1 each. Return dated May 29th (filed August 2nd), 1934. 700,000 ordinary and 250,000 preference shares taken up. £764,900 paid (8s. per share on 22,000 ordinary, 10s. per share on 40,000 ordinary, 14s. per share on 110,000 ordinary and £1 per share on 409,100 ordinary and 250,000 preference shares). £185,100 considered as paid (£1 per share on 118,900 ordinary, 12s. per share on 22,000 ordinary, 10s. per share on 40,000 ordinary and 6s. per share on 110,000 ordinary shares). Mortgages and charges, £350,000 first and £250,000 second debenture stock.

Northwood Electric Light & Power Co., Ltd.—The nominal capital has been increased by the addition of £30,000 in £1

ordinary shares beyond the registered capital of £60,000. (This increase follows a recent reduction.)

Foots Cray Electricity Supply Co., Ltd.—The nominal capital has been increased by the addition of £10,000 in £1 ordinary shares beyond the registered capital of £20,000.

Boston & District Electric Supply Co., Ltd.—The nominal capital has been increased by the addition of £50,000 in £1 ordinary shares beyond the registered capital of £120,000.

E. A. Langrish & Co., Ltd.—The nominal capital has been increased by the addition of £64,246 beyond the registered capital of £15,000. The additional capital is divided into 61,250 "B" preference and 2,996 ordinary shares of £1 each.

John Ismay & Sons, Ltd.—The nominal capital has been increased by the addition of £150,000 beyond the registered capital of £150,000. The additional capital is divided into 100,000 6½ per cent. cumulative preference shares of £1 and 1,000,000 ordinary shares of 1s. Messrs. Ismay are described as manufacturers of incandescent electric lighting apparatus, &c., of Roden Street Works, Roden Street, Ilford. The decision of the company to increase its capital was recorded in the ELECTRICAL REVIEW for August 31st.

Richmond (Surrey) Electric Light & Power Co., Ltd.—Capital, £200,000 in £1 shares. Return dated April 10th (filed July 30th), 1934. All shares taken up. £200,000 paid. Mortgages and charges, nil.

Black Country Tramways Estates, Ltd. (formerly Wolverhampton District Electric Tramways Co.).—Capital, £200,000 in £1 shares. Return dated March 13th (filed July 3rd), 1934. 16,100 shares taken up. £16,100 paid. Mortgages and charges, nil.

Hope's Heating & Lighting, Ltd.—Capital, £50,000 in £1 shares. Return dated June 22nd, 1934. 27,000 shares taken up. £12,737 paid, £14,263 considered as paid. Mortgages and charges, nil.

Bungay Gas & Electricity Co., Ltd.—Capital, £30,000 in 15,000 preference and 15,000 ordinary shares of £1. Return dated June 9th, 1934. 2,092 preference and 7,747 ordinary shares taken up. £4,513 paid on 2,092 preference and 2,421 ordinary shares, £5,326 considered as paid on 5,326 ordinary shares. Mortgages and charges: £8,450.

Tisbury Electric Supply Co., Ltd.—Capital, £6,000 in £1 shares. Return dated June 7th, 1934. All shares taken up. £6,000 paid. Mortgages and charges, nil.

City Notes

Ferranti, Ltd., report a net profit of £68,245 for the year ended June 30th last, after making provision for general establishment charges, bad debts, repairs and renewals, depreciation, &c. as compared with £57,869 in the preceding year. To this is added £46,414 brought in, making £114,659, and after placing £10,000 to general reserve (against nil), it is proposed to maintain the ordinary dividend at 6 per cent. for the year and to carry forward £51,659. The report states that further extensions to buildings and plant have been made during the year. With the report the company has issued an illustrated leaflet describing the "Arcadia Consolette" radio receiver. Meeting: To-day (Friday).

The Société Internationale d'Energie Hydro-Electrique ("Sidro") reports a net profit for the year ended June 30th last of frs. 22,737,497, as against frs. 13,135,831. The ordinary dividend is 7 per cent. (against 6 per cent.).

Philips' Incandescent Lamp Works Holding Co. announces that the directors of the operating company propose to pay a final dividend of Fl. 37.5 per share, making a total of Fl. 82.5 in respect of the period from January 1st, 1933, to April 30th, 1934.

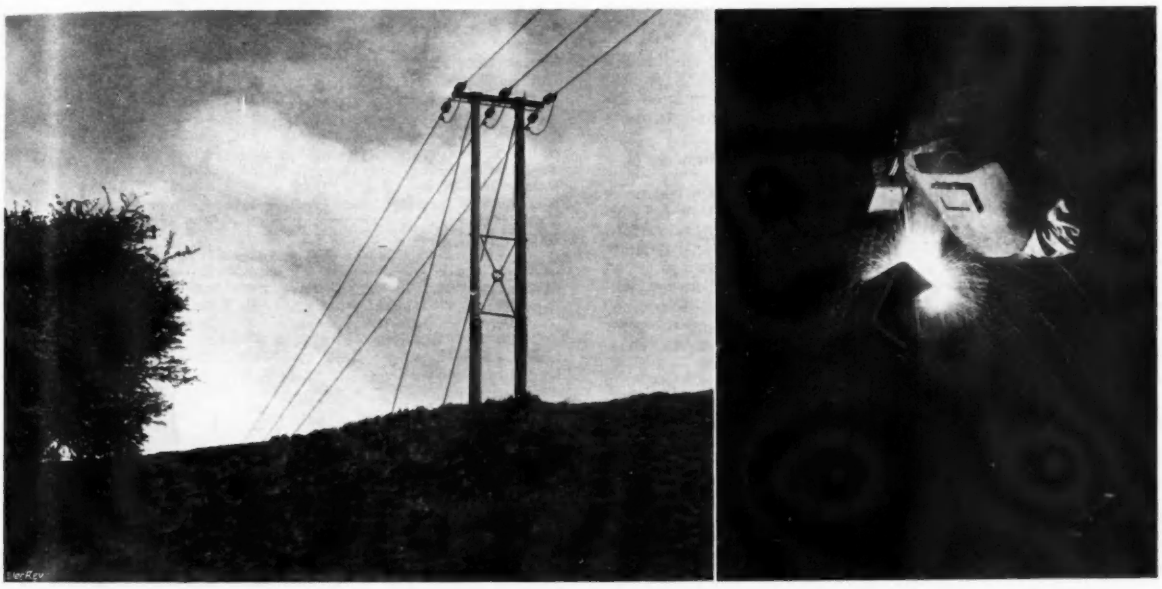
The Power Corporation of Canada reports gross earnings for the year ended June 30th last of $1,525,500, as against $1,485,500 in the preceding year. The net earnings were $1,253,000, as against $1,168,250, and after payment of interest and dividends on the preferred shares $131,500 was transferred to surplus account.

Companies to be Struck Off the Register.—The names of the following companies will be struck off the Register at expiration of three months unless cause is shown to the contrary:—Electronos, Ltd.; Midways Electric, Ltd.; Pearsons Electricals, Ltd.; West Sussex Electrical Co., Ltd.; West Yorkshire Electric Co., Ltd.

W. H. Dorman & Co., Ltd., report a net profit of £1,030 for the year ended March 31st last, as compared with a loss of £12,080 for 1932-33, reducing the debit brought in to £70,463. The report states that petrol engine orders continued to be on a declining basis, but the Diesel engine orders steadily progressed.

The Scottish Power Co. has announced an ordinary interim dividend of 2½ per cent., less tax. A dividend of 5 per cent. has been paid for many years, but no interim distribution has been made previously.

The Electric Supply Corporation, Ltd., is paying an interim dividend on the ordinary shares of 3½ per cent. (against 4 per cent.). A capital bonus of three new shares for every ten held was declared in April last.



Two examples of "Commercial" art seen at the recent Exhibition of Industrial Photography. Left: "Over the Hill"—a Henley transmission line (*photograph by Gordon Turnill*). **Right: Arc welding at Messrs. Reyrolle's works** (*photograph by Philipson & Son, Ltd.*).

Ward & Goldstone, Ltd., have declared the usual interim dividend for the half-year on the cumulative preference shares at the rate of 7 per cent. per annum.

The Hendon Electric Supply Co., Ltd., has announced an interim ordinary dividend of 2½ per cent. (same).

The Electrical Finance & Securities Co., Ltd., is again paying an interim ordinary dividend of 5 per cent.

The Salisbury Electric Light & Supply Co., Ltd., has declared an interim ordinary dividend of 4 per cent. (same).

Stocks and Shares

TUESDAY EVENING.

WITHIN the last year or two, holders of gilt-edged stocks have had, these holders will have thought, quite sufficient shocks, in the shape of reduction of their interest, to justify a hope that such operations had come to an end. The movement was started, it may be recalled, by the conversion of the five per cent. War Loan into the present three-and-a-half per cent. stock. This saved the country a very material sum every year in interest, but the reduction still presses harshly upon proprietors of the five per cent. stock who saw their income suddenly cut down in a manner which has since been followed by a number of industrial undertakings and large borrowers. The Colony of Nigeria has introduced this week a new note of apprehension by offering to convert one of her 3½ per cent. stocks into a 3 per cent., a development which had certainly not been expected, and the issue of which will be awaited with keen, rather uncomfortable, interest.

Jobbing Backwards

Meanwhile, the Central Electricity and the other stocks of various public boards hold all their recent strength. London Passenger Transport stocks show advances of ¼ to 1 per cent., and the yield on the money in the case of the "A" stock is now a little under 3¾ per cent. It is interesting to recall that exactly three years ago this country departed from the gold standard. It was on Sunday, September 20th, 1931, that the decision to do this was reached. At the same time, the Bank Rate was raised to 6 per cent., and the Stock Exchange was

asked to close for a few days. The present Bank Rate is 2 per cent., and has been in force since the end of June, 1932.

Departure from the gold standard has been followed by price-movements of which these are representative :—

Stock.	Red.	September 18th.		Rise.
		1931.	1934.	
Central Electric, 4 p.c.	1959–89	83	107	24
,, ,, 5 p.c.	1950–70	100	115	15
,, ,, 4½ p.c.	1951–73	94½	110	15½
West Midland, 5 p.c.	1948–68	101½	113	11½

Electricity Supply Shares

The Scottish Power Company has at length yielded to the request that the directors should declare an interim dividend, instead of waiting until the end of the year, and then to pay one dividend for the twelve months. The present rate of 2½ per cent. will no doubt be made up to the regular 8 per cent. at the end of the year. North Metropolitans are a little lower at 3$\frac{1}{16}$. Electric Finance & Securities ordinary shares at 63s. are also ex dividend. Amongst the lower-priced shares connected with electrical companies, Atlas ordinary have come into demand, and have moved up to 7s.

Several hundred London Electric 6 per cent. non-cumulative preference shares of £5 each came to market at 7$\frac{15}{16}$. The next dividend is due in March, 1935. At the price mentioned the yield is £4 2s. on the money : the earnings are ample to meet the dividend service.

Electric Power Trust

An interesting registration is that of a private company with a capital of £100,000, called the Electric Power & Communications Trust, Limited. The object is to acquire certain assets from the Telephone & General Trust and British Insulated Cables. What the assets are has not been stated. The Telephone & General Trust is a holding company, and it will be interesting to know what sort of assets the newcomer intends to acquire from the former company, whose ordinary and preference shares stand at about the same price, 29s. 9d.

Cables and Wireless

The unusual vitality which has been noticeable during the past few weeks in the Cables & Wireless trio brought about a hardening of prices which, in its turn, has been followed by a certain amount of profit-taking on the part of the earlier buyers. In consequence, the 5½ per cent. preference at 74, and the "A" ordinary at 16, show reaction. The speculative investor is watching, however, the preference stock with an attention which is reflected in his occasional purchase of moderate amounts that are paid for and put away for future reference. Cables & Wireless stocks are eminently of that class. Supporters must be ready to exercise patience, because it may be some time before the Combine can pay the full 5½ per cent. dividend to which the preference stock is entitled. Globe ordinary have gone back in sympathy with the decline in Cable stocks. Great Northern Telegraphs at 37 are 10s. down. In the American group, American Telephone & Telegraphs are quoted ex dividend at 109½.

Manufacturing and Equipment Shares

Johnson & Phillips have been a very good market during the past week, the price rising at one time to 27s. as against 22s. 6d. at which it stood a fortnight ago. Profit-taking caused an easing off to 26s. 3d. Another good spot in this market is the strength of Enfield Cables ordinary shares. The purchase of 1,000 shares helped to put up the price by 2s. 6d. to 87s. 6d. There seems to be an impression that the company's dividend, reduced last year from 25 per cent. to 20 per cent., may be restored to the previous rate before very long. Moreover, rumour says that the Enfield Rolling Mills Company is doing well.

There is an obvious willingness on the part of the investor to buy the ordinary shares of the Electrical Equipment & Manufacturing Companies. British Aluminium are 1s. better. Edison Swan First preference moved up $\frac{1}{16}$ to 22s. 6d. Associated Electric Industries ordinary are a good market at 21s. 6d. Electric & Musical Industries have come into request on the hope that the company may declare an interim dividend. The 10s. shares are quoted at 27s. 9d. It is said that success is waiting upon the company's new household utility branches, and that its business in refrigerators, &c., is making substantial progress. Ferranti preference are firm at 26s. 6d. upon publication of an excellent report. The rubber share market went easier upon the news that Siam had broken away from the Restriction Regulation scheme. The price of raw rubber dropped somewhat abruptly, but recovered upon consideration of the probability that what difficulty may have arisen in connection with Siam is capable of early adjustment.

Dollar Stocks

Affairs in Mexico continue in the unsettled state for which the various cross-currents at present operating in that country are responsible. Mexico Tramway Fives have fallen 3 points to 17½, but the Mexican Light & Power issues show no further changes. A good deal of activity in Brazilian Traction shares resulted in the price being raised 1$\frac{1}{8}$ to 11½. The American-Canadian Utilities keep fairly steady, although there has been no revival of British interest in these particular insecurities.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend. 1932.	Dividend. 1933.	Price. Sept. 18.	Rise or Fall.	Yield. p.c. £ s. d.
Bournemouth and Poole	1	15	15	78/9	—	3 16 2
Brompton Ordinary	1	7	7	34/–	—	4 2 4
Charing Cross Ordinary	1	7	7	34/6	—	4 1 2
Chelsea	1	7	7	34/–	—	4 2 4
City of London	1	7½	7½	36/3	—	4 2 9
Clyde Valley	1	7	7	38/9	—	3 12 2
County of London	1	10½	10½	57/6	—	3 13 1
Edmundson's 7% Pref.	1	7	7	34/6	—	4 1 2
Elec. Dis. Yorkshire	1	9	9	47/6	—	3 15 9
Elec. Supply Corporation ...	1	11	11	60/–	–9d.	3 13 4
Kensington Ordinary	1	7	7	34/–	—	4 2 4
Lancs Light and Power	1	7	7½	37/6	—	4 0 0
London Electric	1	7	7	34/–	—	4 2 4
Metropolitan	1	10	10	53/9	—	3 14 6
Midland Counties	1	7	7	37/6	—	3 14 8
Mid. Elec. Power	1	8	8	43/9	—	3 13 2
North Eastern Electric Ordinary	1	6	6	33/–	—	3 12 10
Do. 7% Pref.	1	7	7	35/–	—	4 0 0
Northampton	1	10	10	53/–	—	3 15 4
Notting Hill 6% Pref.	10	6	6	14½	—	4 4 4
North Met. Elec. Ordinary ...	1	10	10	3$\frac{1}{16}$	–½	3 5 3
Do. do. 6% Pref.	1	6	6	31/6	—	3 16 2
St. James' and Pall Mall ...	1	7	7½	36/–	—	4 3 4
Scottish Power	1	8	8	40/–	—	4 0 0
South London	1	7	7	35/6	—	3 19 0
Westminster Ordinary	1	7	7	34/–	—	4 2 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	22/–	+1/–	6 16 4
Yorkshire Elec.	1	8	8	46/3	—	3 9 1

PUBLIC BOARDS.

Central Electricity, 1950–70 ...	Stock	5	5	115	—	4 7 0
Do. 1955–75 ...	,,	5	5	116	—	4 4 9
Do. 1951–73 ...	,,	4½	4½	110	—	4 1 10
Do. 1963–93 ...	,,	—	3½	101	—	3 9 4
London & Home Counties, 1955–75	,,	4½	4½	110	—	4 1 10
London Passenger Transport, A...	,,	—	4½	121	—	3 14 5
Do. do. B...	,,	—	5	126	+1	3 19 4
Do. do. C...	,,	—	3	81	+1	3 14 0
West Midlands Joint Elec. 1948–68	,,	—	5	113	—	4 8 6

TELEGRAPH AND TELEPHONES.

American Tel. & Tel.	$100	9	9	109½xd	—	8 4 5
Anglo-Am. Tel. Pref.	Stock	6	6	112	—	5 7 2
Do. Def.	,,	1½	1½	27	—	5 11 1
Cables & Wireless 5½% Pref. ...	,,	2¾	2¾	74	–1	3 14 4
Do. A. 7½% Ord.	,,	Nil	Nil	16	–1	—
Do. B. Ord.	,,	Nil	Nil	8	—	—
Globe Tel. and T. Ord.	10	Nil	2½	9½	–½	2 12 8
Do. do. Pref.	10	6	6	12½	—	4 16 0
Great Northern Tel.	10	20	20	37	–½	5 8 1
Marconi-Marine	1	10	7½	31/3	—	4 16 0
Oriental Telephone Ord.	1	12	12	3$\frac{1}{16}$	—	*3 15 3

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	1/6	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5½	—	—
British Electric Traction Df. Ord.	,,	5	5	685	—	—
Do. do. Pref. Ord.	,,	8	8	160½	—	4 19 8
Brazil Traction	100	—	—	11½	+½	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	105	—	4 15 3
Mexico Trams, 5% Bonds ...	—	5	5	17½	–3	—
Mexican Light Common	100	Nil	Nil	2½	—	—
Do. 7% Pref.	100	7	7	4½	—	—
Do. 1st Bonds	—	5	5	35	—	—
Victoria Falls Ord.	1	15	20	6¼	–$\frac{1}{16}$	3 2 9
Yorkshire (West Riding) ...	1	2½	5	25/–	—	4 0 0

MANUFACTURING COMPANIES.

Aron Electricity Ord.	1	10	10	3	—	3 6 8
Assoc. Elec. Ord.	1	4	3	21/6	—	2 15 10
Do. Prf.	1	8	8	32/6	—	4 18 6
Babcock & Wilcox	1	9	6	43/6	—	2 15 2
British Aluminium Ord.	1	5	5	29/3	+1/–	3 8 3
British Insulated Ord.	1	15	15	73/6	—	4 1 3
Brush Ord.	Stock	Nil	Nil	33	—	—
Callender's...	1	15	15	3½	—	4 12 4
Do. 6½% Pref.	1	6½	6½	31/3	—	4 3 2
Crompton Parkinson Ord. ...	5/–	22½	12½	27/–	—	4 12 7
Do. 8% Pref.	1	8	8	33/9	—	4 14 10
Edison-Swan 1st Pref.	1	7½	7½	22/6	+$\frac{1}{16}$	6 13 4
Do. 5% Deb.	Stock	5	5	107½	—	4 13 0
Electric Construction	1	Nil	Nil	13/9	+½	—
Enfield Cable Ord.	1	25	20	87/6	+½	4 11 1
English Electric	1	Nil	Nil	5/9	—	—
Do. do. Pref.	1	Nil	Nil	11/3	+6d.	—
Ever Ready	5/–	35	35	27/6	—	6 7 3
Ferranti Pref.	1	7	7	26/6	—	5 5 8
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	8	8	46/3	—	3 9 3
Henley's	1	30	30	6½	—	4 17 8
Do. 4½% Pref.	5	4½	4½	5½	—	4 1 9
India-Rubber Preferred	1	—	—	18/9	—	—
Johnson & Phillips	1	5	5	26/3	+$\frac{1}{16}$	3 16 2
Siemens Ord.	1	6½	4	18/9	—	4 5 4
Telegraph Construction	£1	Nil	Nil	1	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1932

36040. "Automatic circuit-breakers." December 20th, 1932. (Cognate application 703/33.) (415393.)

36236. "Insulation, particularly suitable for use in electric transformers." International General Electric Co., Inc. December 21st, 1931. (415414.)

36238. "Electric convertor systems." British Thomson-Houston Co., Ltd. December 22nd, 1931. (415394.)

36379. "Method, and apparatus for, producing periodic switching or modulating effects." Dr. H. J. Spanner and L. L. de Kramolin. December 22nd, 1932. (Convention date not granted.) (415396.)

1933

4800. "Indirectly heated cathodes for electron-discharge devices." International General Electric Co., Inc. February 16th, 1932. (415398.)

5094. "Overhead electrical power transmission systems." Pirelli-General Cable Works, Ltd., and J. R. Harding. February 18th, 1933. (415400.)

5247. "Automatic circuit-breakers." J. A. Crabtree. February 21st, 1933. (415387.)

5308. "Submarine electrical signalling systems." Electrical Research Products, Inc. February 25th, 1932. (415389.)

5372. "Thermionic valve oscillators." G. B. Baker. February 22nd, 1933. (415403.)

5449. "Circuits for wireless receiving apparatus." V. England-Richards and England-Richards Fluid-Free Cell Co., Ltd. February 22nd, 1933. (415430.)

5468. "High-vacuum cathode-ray tubes." Fernseh Akt.-Ges. February 23rd, 1932. (415411.)

5481. "Electric lamp fittings." Ascog, Ltd., and H. S. Fields. February 22nd, 1933. (415431.)

5593. "Charging of batteries from variable-voltage generators." Sir W. G. Armstrong, Whitworth & Co. (Engineers), Ltd., D. J. Watkins and D. C. Plyer. February 23rd, 1933. (415432.)

5652. "Road-traffic control systems." A. Reyrolle & Co., Ltd., and F. N. Linstow. February 24th, 1933. (415434.)

5716. "Means for converting electric currents." International General Electric Co., Inc. February 24th, 1932. (415439.)

5723. "Thermionic valves for use in wireless receiving systems." A. C. Cossor and F. M. Walker. February 24th, 1933. (415440.)

5725. "Thermionic valves." M-O Valve Co., Ltd., and J. F. Jackson. February 24th, 1933. (415441.)

5743. "Moving-coil electrical instruments." H. S. Tenny. February 24th, 1933. (415442.)

5744. "Moving-coil electrical instruments." H. S. Tenny. February 24th, 1933. (Cognate application 5745/33.) (415443.)

5746. "Moving-oil electrical instruments such as loud-speakers and the like." H. S. Tenny. (February 24th, 1933. (Cognate application 5747/33.) (415444.)

5811. "Thermionic valve oscillation generators." British Thomson-Houston Co., Ltd., and T. H. Kinman. February 25th, 1933. (415464.)

5883/4. "Mercury-arc rectifiers." A. Reyrolle & Co., Ltd., and H. H. Taylour. February 27th, 1933. (415469/70.)

5951. "Electric totalisators." Automatic Electric Co., Ltd., and R. N. Saxby. February 27th, 1933. (415473.)

6360. "Electric lamps of the gaseous discharge type." I. Rennerfelt. March 2nd, 1932. (415483.)

6415. "Electrostatic machines." British Thomson-Houston Co., Ltd. March 2nd, 1932. (415484.)

7144. "Electric lampholders." R. Nettl. March 9th, 1933. (415491.)

7704. "Loud-speakers." Magnavox Co. March 14th, 1932. (415495.)

8119. "Selenium and like cells." C. Chilowsky. March 17th, 1932. (Cognate application 8120/33.) (415497.)

8325. "Electric lampholders and adaptors." C. T. A. Shearer. March 16th, 1934. (415499.)

8652. "Fittings for the overhead contact conductors of electric traction systems." British Insulated Cables, Ltd., and J. W. Astley. March 22nd, 1933. (Addition to 381321.) (Cognate application 12934/33.) (415503.)

9062. "Reception of high-frequency oscillations." Hazeltine Corporation. April 9th, 1932. (415504.)

9171. "Lampholders for electric lamps of tubular form." General Electric Co., Ltd., F. G. Quance and S. R. Bussey. March 27th, 1933. (415506.)

10727. "Liquid-immersed electric circuit interrupters." G. A. Juhlin, W. A. Coates, and Associated Electrical Industries, Ltd. April 10th, 1933. (415522.)

13216. "Automatic circuit-breakers." J. A. Crabtree. May 6th, 1933. (415534.)

14428. "Impulse transmitters for automatic telephone systems." F. W. Hall and Hall Telephone Accessories (1928), Ltd. May 18th, 1933. (415538.)

15375. "Electric valve circuits." British Thomson-Houston Co., Ltd. May 27th, 1932. (Cognate application 15376/33.) (415546.)

15741. "Systems of electric motor control." British Thomson-Houston Co., Ltd. June 2nd, 1932. (415547.)

18721. "Gas-discharge devices." E. Von Lepel. July 1st, 1932. (415554.)

19357. "Electric arc welding." Kabushiki Kaisha Kawasaki Zosensho. October 22nd, 1932. (415556.)

19696. "Electric radiators." H. Frost & Co., Ltd., and A. W. Moss. July 12th, 1933. (415561.)

20830. "Ward-Leonard control systems." Rheinische Metallwaaren-und Maschinenfabrik. January 14th, 1933. (Cognate application 20831/33.) (415568.)

21272. "Electric discharge tubes." General Electric Co., Ltd., and A. G. Pearce. July 28th, 1933. (415570.)

22081. "Radio-receiving installations with automatic volume control." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 28th, 1932. (415573.)

22094. "Attachments for the earpieces of radio or telephone receivers." O. W. Moller. August 5th, 1933. (415574.)

22204. "Protective electrical circuits for power lines and the like." Siemens-Schuckertwerke Akt.-Ges. August 8th, 1932. (415576.)

22632. "Small synchronous motor." Landis & Gyr Akt.-Ges. August 19th, 1932. (415580.)

23366. "Thermo-electric devices." G. Fitterer. August 23rd, 1932. (Cognate application 23367/33.) (415584.)

24232. "Device for generating currents and voltages of saw-tooth wave form." T. Nakashima, K. Takayanagi, and A. Yamashita. December 29th, 1932. (415589.)

27299. "Radio-receiving systems." Radio-Frequency Laboratories, Inc. November 4th, 1932. (415598.)

30388. "Radio receivers and like apparatus." Marconi's Wireless Telegraph Co., Ltd. November 25th, 1932. (415612.)

30482. "Device comprising at least one electric discharge lamp." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. November 15th, 1932. (Cognate application 30483/33.) (415613.)

32669. "Devices for emitting and receiving ultra-short waves." J. Pintsch Akt.-Ges. and Dr. K. Kohl. December 6th, 1932. (415616.)

33199. "Thermionic amplifiers." Marconi's Wireless Telegraph Co., Ltd. November 26th, 1932. (415619.)

34621. "Galvanic batteries." Oldham & Son, Ltd., and H. Holt, jun. December 8th, 1933. (415626.)

1934

5425. "Ventilated induction motors." Chicago Pneumatic Tool Co. March 31st, 1933. (415657.)

5682. "Automatic electric circuit-breakers." J. A. Crabtree. February 21st, 1933. (Addition to 35911/33.) (Divided application on 415387.) (415413.)

5986. "Housings and mountings for dynamo-electric machines." Siemens-Schuckertwerke Akt.-Ges. February 23rd, 1933. (415421.)

8890. "Transformer connections for electric discharge devices with parallel operating anodes." British Thomson-Houston Co., Ltd. March 22nd, 1933. (415668.)

8899. "Road-traffic control signal apparatus." J. Heuer. March 21st, 1934. (Addition to 368671.) (415669.)

11249. "Electrodes for use in apparatus for the electrical precipitation of suspended particles from gaseous fluids." Lodge-Cottrell, Ltd. (Siemens-Lurgi-Cottrell-Elektrofilter-Ges. für Forschung und Patentverwertung). April 13th, 1934. (415676.)

12859. "Traffic signals for motor or other vehicles." J. Richardson. April 28th, 1934. (415680.)

13411. "Circuit arrangements comprising a gasfilled electric discharge tube." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 24th, 1933. (415682.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from September 12th.

ER (lettering and design). No. 552879. Class 8. Instruments and apparatus and parts thereof for use in wireless telegraphy and telephony. No. 552880. Class 10. Electric clocks.—The Earl Manufacturing Co., Ltd., Avenue Works, Hanover Park, Peckham, S.E.15.

Styroflex. No. 551316. Class 8. Electric cables, condensers, measuring instruments, radio receiving and transmitting sets and parts thereof.—Norddeutsche Seekabelwerke Gesellschaft, Nordenham, Oldenburg, Germany (British representatives: Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2).

British Manufacture; Thomas Bolton & Sons, Ltd., Oakamoor and Froghall, N. Staff (lettering and design). No. 539975. Class 13. Copper pressings, being finished goods for use in electric lighting, heating, and power installations, and electrodes for welding purposes, &c.—Thomas Bolton & Sons, Ltd., Mersey Copper Works, Widnes, Lancs.

Efesca Servis (lettering and design). No. 550072. Class 18. Electric cooking and heating appliances.—Falk, Stadelmann & Co., Ltd., 83-93, Farringdon Road, E.C.1.

Diesel-electric Trains in Canada

IN a report recently issued Mr. R. C. Gage, chief electrical engineer of the Canadian National Railways, discusses the merits and demerits of rail traction, with special reference to the use of light-weight high-speed Diesel engines directly connected to electric generators. His experience dates back to 1925, when the Canadian National Railways entrusted Messrs. William Beardmore to supply two eight-cylinder and four-cylinder Diesel engines. Success attended his experiment and two years later more Diesel engines were ordered, followed again by further orders from the same firm and its American licensee, until by 1933 there were in operation twenty-eight railcars, all using Beardmore-type Diesel engines with a total mileage of 6,735,244 miles to their credit at an average total cost of 38 cents. per train mile. Geographically and climatically the conditions peculiar to the Canadian National Railways are much more exacting than those in Europe or elsewhere. Mr. Gage states that "the twenty-eight railcars operated in territories far remote from each other and from regional and system headquarters and by the very nature of their service are on runs having, in many cases, hardly any maintenance facilities."

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdare.—Houses (50); Housing Committee.
Alnwick.—Houses (80); J. T. Wilson, architect.
Andover (HANTS).—Houses (36); R.D.C. surveyor.
Annan.—Houses (54); burgh surveyor.
Ashton-under-Lyne.—Houses (70), Lees Road site, for the Housing Committee; J. Rowbottom, borough surveyor.
Auchtermuchty.—Three blocks of houses; Moncrieff Bros., Shorehead, Leven.
Aylesbury.—Territorial headquarters (£10,000); C. H. Wright, architect, Temple Street.
Bannockburn (STIRLINGSHIRE).—Houses (12); D. W. Glass, County Buildings, Stirling.
Blaenau Festiniog (MERIONETHSHIRE).—Clinic for King Edward VII Welsh National Memorial Association; R. C. Jones, architect.
Blaydon.—R.C. school; Stieulet & Maxwell, architects, Saville Chambers, Newcastle-on-Tyne.
Blyth.—Houses (182); L. Leeper, borough engineer.
Bourne (LINCS).—Houses (50); U.D.C. surveyor.
Bournemouth.—Café, Undercliff Drive (£13,754); Geo. Shears & Sons. Development of Somerset Gardens Estate, Castle Lane; A. R. Hook.
Brechin.—Houses (14), Inch and Dall's Lane; W. W. Young, burgh surveyor, 30, Panmure Street.
Brighton.—Senior school, Patcham, for Borough E.C.; Thomas Simpson & Son, architects, 16, Ship Street.
Bristol.—Alterations to Colston Hall (£34,396); C. F. W. Dening, architect.
Bromsgrove.—Factory, Worcester Road, for Brompton Mineral Water Company, Worcester Road; J. & A. Brazier & Co., Ltd., builders, Worcester Road.
Calderbank (LANARKSHIRE).—Houses (40); P. C. Smith, housing engineer, 13, Clydesdale Street.
Cambridge.—Houses (46) (electrical work), Woodlands Estate, Girton Village; Harvey & Dodson (Builders), Ltd., 9, Llandaff Chambers.
Canterbury.—Public baths (£15,770); city surveyor.
Carlisle.—Houses (20), Upperby Road; Gilbert Hill (solicitors, Clutterbuck, Trevenen & Mawson). Shops, Orton Road; Border Engineering Contractors, Ltd.
Carmarthen.—Maternity block, County Infirmary (£30,000); governors.
Cheshire.—Schools, Lawton & Alsager, for County E.C.; director of education, Chester.
Chester.—Arcade of shops and offices, St. Werburgh Street, for Hodgkinson Trustees; Maxwell Ayrton, architect.
Chester-le-Street.—Alterations to Chester Cinema and Empire Cinema; H. Smelt, builder, Whickham.
Cirencester.—Houses (23), Bowling Green site; Messrs. Kear, builders.
Clacton-on-Sea.—Reconstruction of band pavilion (£28,300); U.D.C. surveyor.
Crakehall (YORKS).—Church (£2,000), for the Methodist trustees; T. & J. Willoughby, builders, Northallerton.
Crieff.—Houses (16), Kincardine; D. P. Boath, burgh surveyor, James Square.
Dagenham (ESSEX).—St. George's Church (£6,000); Milner & Craze, architects.
Dewsbury.—Houses (30), Scopsley Lane, Whitley; borough surveyor.
Dingwall.—Academy (£4,500); clerk, Education Committee.
Dorset.—Additions and alterations to Wool Bovington Council School for C.C.; county architect, County Offices, Dorchester.
Douglas (I. of M.).—Houses (12), Thornton Estate; T. H. Cowin. Alterations to Peverill Hotel; Peverill Hotel Co., Ltd.
Dover.—Flats (£12,945); G. Lewis & Sons, builders.
Duns.—Cinema, Easter Street, for M. Burns.
East Plean (STIRLINGSHIRE).—Houses (16); D. W. Glass, County Buildings, Stirling.
Elmers End.—Factory, Long Lane, Elmers End, for R. & A. Kohnstamm, Ltd.; C. H. Gibson, Ltd., builders, Croydon.
Fifeshire.—Clinic, Lochgelly (£2,503), for C.C.; G. Sandilands, Education Offices, Kirkcaldy.
Fletton.—Swimming bath, opposite Fletton Lodge; London Brick Co. & Forders, Ltd.
Garstang.—Houses (20); J. Cooke, surveyor.
Glasgow.—Houses (54), Haghill, and 186 houses, Elmvale Row; housing director and trade contractors. Gymnasium, St. George's Road School (£3,400); education director and trade contractors. School, East Keppoch (£3,895); J. & C. Fleming. Extensions, Rosehill works, Polmadie; British Oxygen Co., Ltd.
Guildford.—Extensions, Woodbridge Hospital (£7,000), for the Joint Hospital Board; F. W. Norris, architect.
Hamilton.—Houses (900), Udston Farm, 224 houses, Bent Farm, and 52 at Gateside Street (£250,000); P. C. Smith, 13, Clydesdale Street.
Hampshire.—Extension, Senior Mixed School, Wilden Lane. Hedge End, for County E.C.
Hampton.—Houses (17), Dean Road; W. J. Shepherd. Houses (442), Manor House Estate; R. Lancaster & Son. Houses (14), Oldfield Road; E. Carter Clout.
Hebburn-on-Tyne.—Houses (50) for aged people; Page & Son, architects, 67, King Street, South Shields.
Hemel Hempstead.—Houses (50), Wood Lane; A. E. Brown, builder, West Ealing.
Hertfordshire.—Schools (634 places), Osidge Estate; Chase Side, East Barnet Valley, for County E.C.; A. E. Prescott, county architect, Hatfield.
High Wycombe.—Houses (24), Stokenchurch; A. C. Bean, builder.
Hilsea (PORTSMOUTH).—Swimming baths, restaurants, &c. (£26,285); Bolton & Lakin, Ltd., Birmingham.
Ipswich.—Extensions to Mental Hospital (£10,000); borough engineer.
Kent.—Central school, St. Mary Cray, for County E.C.; R. J. Barwick, builder, Dover.
Kirkburton.—Houses (10), Tunshaws; G. M. Barr, architect, Hall Farm, Flockton.
Lancashire.—School (520 places), Davyhulme, Urmston, for County E.C.; director of education, Preston.
Leeds.—Extensions to Meanwood Park Mental Colony (£120,000); J. M. Sheppard & Partners, 38, Bedford Place, London, W.C.1.
Leighton Buzzard.—Houses (24); U.D.C. surveyor.
Manchester.—Yew Tree Senior School, Wythenshawe; surveyor, Education Offices, Deansgate.
Middlesbrough.—Houses (200), Brambles Farm Estate, and additions to the Dormer Museum (£2,000); S. E. Burgess, borough engineer.
Monmouth.—Houses, Rockfield Road; borough surveyor.
Montrose.—Houses (38); Thomas Whyte, chartered surveyor, Dundee, measurer.
Musselburgh.—Houses (24), Falten Green Lane; J. Logan, burgh surveyor, Municipal Buildings.
Newburn-on-Tyne.—Houses (150); J. H. Wetherley, surveyor.
Newcastle-on-Tyne.—Houses (190), £55,767; W. D. Allison, builder, Whitburn. Additions to St. Luke's Church (£8,000); Wood & Oakley, architects, 9, Eldon Square.
Newport (MON).—Houses (102), Maesglas; R. D. Jones, builder, Nantgarw.
Northampton.—Public baths; J. C. Prestwich & Sons, architects, Bradshawgate Chambers, Leigh, Lancs.
Northern Ireland.—(COLERAINE, CO. LONDONDERRY).—Cinema, Railway Road, for the Coleraine Picture Palace Co., Ltd.; J. S. Kennedy, architect.
Northwich.—Houses (178); J. Birtwistle, R.D.C. surveyor.
Norwich.—Houses (40), Elm Grove (£20,000); city engineer.
Penrith.—Houses (12), Roper Street; Kitchen & Atkinson.
Peterborough.—Houses (33), Park Lane Estate, West Side, near Padholme Road; city engineer and surveyor.
Plains (LANARKSHIRE).—Houses (32); P. C. Smith, housing engineer, 13, Clydesdale Street.
Purfleet (ESSEX).—Houses (20); U.D.C. surveyor.
Ramsgate.—Houses (20), for Grummant Bros., Grange Road. Aerodrome, Rumfields; town clerk.
Redditch.—Houses (100), Salter's Lane Estate; U.D.C. surveyor.
Richmond (SURREY).—Houses, Marksbury Estate (32), Windham Road (18) and Lovell Road, Ham (20); borough engineer.
Rushden.—Houses and shops, Wellingborough Road, and houses, Upper Queen Street; T. Swindall & Sons.
Rutherglen.—Houses (150), Blackfaulds; H. Inglis, burgh surveyor, 169, Main Street.
St. Neots.—Houses (21), Crescent House Estate, Huntingdon Road, and Cambridge Gardens Estate, Cambridge Street; E. B. Parkinson, architect, Hemingford Grey, Hunts.
Scunthorpe.—Extensions, War Memorial Hospital (£25,000); secretary.
Sedgefield (DURHAM).—R.C. church; Rev. Father Lucey, West Cornforth.
Sedgley.—Houses, Bird Street; T. Alwyn Lloyd, architect. Houses (18), Robert Street; Messrs. Russells. Houses (42), Upper Gornal (£11,970); Nathan Hyde.
Sheffield.—Houses (500), on the Corporation estates, for the Sheffield Estates Committee. Block of flats, Duke Street Park, for A. J. Krausz, Rockingham Street; E. Gardham, architect, Mazda Buildings, Campo Lane.
Slough.—Re-erection of box factory, Trading Estate, for John Barker & Co., Ltd., High Street, Kensington, W.
Southampton.—Employment exchange; H.M. Office of Works, London, S.W.1.
South Shields.—Houses (11), Banbury Terrace; F. W. Newby, architect.
Staffordshire.—Alterations and additions, Rugeley Grammar School; Director of Education, Stafford.
Stockton-on-Tees.—Houses (46), Clarence Potteries; A. E. Hobbs, builder, Hill House, Norton-on-Tees. Houses (78), near Ida Street; F. Craven, builder, Liverpool Buildings, West Hartlepool.
Sudbury.—Houses (36), Wents Estate; Bailey & Goates, builders.
Sunderland.—Cinema and shops, Fulwell; P. L. Browne & Son, architects, Pearl Buildings, Newcastle-on-Tyne.
Swansea.—School, Derwen Fawr Road; Rev. Rees Howells.
Swinton & Pendlebury.—Town hall (£65,000); P. Thomas (Cardiff) and E. Prestwich (Leigh), joint architects.
Tamworth.—Rebuilding Palace Theatre; Mr. Larkman, of Vernon & Shakespeare, Birmingham.
Tanfield.—Houses (50); J. R. Heslop, surveyor.
Tranent.—Houses (52); R. Robertson, burgh surveyor, High Street.
Walsall.—Houses (438), Delves Estate; borough engineer. Houses (69), Fullbrooke Estate (£18,216); L. G. Peace.
Walsingham.—Houses (40), Fakenham, Norfolk; G. W. Little, Council's Housing Officer, Council Offices, Fakenham.
Waltham Abbey.—Alterations and extensions, Isolation Hospital, Honey Lane; clerk to the Waltham Joint Hospital Board.
Wem (SALOP).—Houses (28), Barnard Street; F. Morcom, U.D.C. surveyor, Barber House.
Willington (DURHAM).—Houses (60); U.D.C. surveyor.
Wilton.—Houses (24); R. O. Brown, architect.
Wishaw.—Houses (120), Greenland site; L. Costley, burgh surveyor, Town Hall, Motherwell.
Woking.—Swimming pool, Constitution Hill Recreation Ground; U.D.C. engineer and surveyor.